SCHOOL OF
CIVIL ENGINEERING

INDIANA
DEPARTMENT OF TRANSPORTATION

JOINT HIGHWAY RESEARCH PROJECT

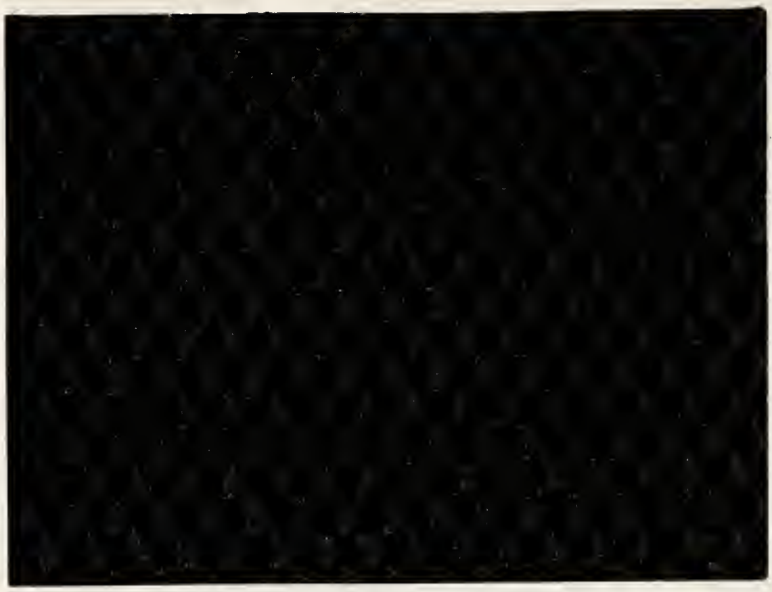
FHWA/IN/JHRP-92/16

Final Report

# ENGINEERING SOILS MAP OF JOHNSON COUNTY, INDIANA

Wei-Yao Chen

PURDUE UNIVERSITY



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Wei-Yao Chen

FINAL REPORT

# ENGINEERING SOILS MAPS OF JOHNSON COUNTY, INDIANA

by

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Joint Highway Research Project

Project No.: C-36-51

File No. 1-5-2-8

Prepared as Part of an Investigation

Conducted by
Joint Highway Research Project
Engineering Experiment Station
Purdue University

in cooperation with

Indiana Department of Transportation
Indianapolis, Indiana

School of Civil Engineering
Purdue University
West Lafayette, Indiana

June 7, 1992

## ACKNOWLEDGMENTS

The author wishes to express his appreciation to Professor C. W. Lovell for providing the opportunity to work on this project.

Thanks are also due the members of the Joint Highway Research Board for their continued support of the county soil mapping project.

The author also wishes to acknowledge D. Yang for skillfully drafting the Engineering Soil Map of Johnson County and other figures included in this report, and Rita Pritchett for typing the classification test results presented in Appendix A.

Additionally, the author would like to thank his parent and wife for their unending encouragement and financial support.

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# ENGINEERING SOILS MAP
# OF
# JOHNSON COUNTY, INDIANA

## INTRODUCTION

The engineering soils map of Johnson County, Indiana that accompanies this report was prepared by airphoto interpretation techniques using accepted principles of observation and inference. The 7-inch x 9-inch aerial photographs used in this study were taken in the summer of 1971 for the United States Department of Agriculture. The airphotos have an approximate scale of 1:20,000, and the attached Engineering Soil Map was prepared at a scale ratio of 1:63,360 (1 inch = 1 mile).

Standard symbols were developed by the staff of the Airphoto Interpretation Laboratory of the School of Civil Engineering at Purdue University, and they were employed to delineate landform-parent material associations and soil textures. Extensive use was made of the Agricultural Soil Survey of Johnson County published in 1979 (1). It was particularly useful as a cross-reference to check soil boundaries, and to locate gravel pits and ponds that were not present on the 1971 aerial photographs.

The text of this report supplements the Engineering Soil Map. It includes general descriptions of the study area, and the different landform-parent material regions. Engineering considerations associated with each region are also briefly addressed.

The map and report are part of a continuing effort to complete a comprehensive soil survey for the state of Indiana. Included on the map is a set of subsurface soil profiles that illustrate the approximate variation of the soils in each landform-parent material area. The profiles were constructed from information obtained from

agricultural literature and from boring data collected from roadway and bridge site investigations (28-34)[1]. Boring locations are shown on the map. Appendix A contains a summary of boring data and classification test results for these locations. The physical, chemical, and engineering index properties of these soils are included in Appendices B and C. Lastly, useful correlations for estimating soil properties are collected in Appendix E.

---

[1] Numbers in parentheses refer to list of references.

# DESCRIPTION OF THE AREA

## GENERAL

Johnson County is located in the central part of the State of Indiana as illustrated in Figure 1. The county was established in 1822 and named in honor of Judge John Johnson of Indiana Supreme Court (2). The county is bordered by the Shelby County on the east, by Bartholomew and Brown Counties on the south, by Morgan County on the west, and by Marion County on the north. The county has its county seat at Franklin, which is about 20 miles south of Indianapolis. The county is about 16 miles wide (east-west) by 20 miles long (north-south), and consists of an area of 201,600 areas, or 315 square miles (1).

Johnson County is served by two railroads and two public airports. The two railroads are the Illinois Central and the Penn Central, which cross the county from north to south. The two airports are for light planes. One is located in the north part on the east edge of the city of Greenwood, and the other is about 4 miles south of the city of Franklin (1). The county also has about 17 miles of interstate highways, 257 miles of other federal highways and state highways, and 560 miles of county roads (1). The Interstate Highway 65, U.S. Highway 31 and State Road 135 are the major roads in north-south direction, whereas the State Roads 144, 252, 37, and 44 are in east-west direction. Most of the public roads in the county are paved (1).

The population of Johnson County was about 83,200 in 1986, and has grown steadily from 61,000 in 1970. The townships adjacent to Marion County are experiencing the greatest gain in population. The population density was 259 people per square mile. Franklin, the county seat, has a population of about 11,600 in 1980. A population summary of the important cities and towns in the county is given in Table 1.

Farming is the leading enterprise in the county. Cash grain and livestock are the major products. Corn, soybean, and wheat are the major crops. The major kinds of

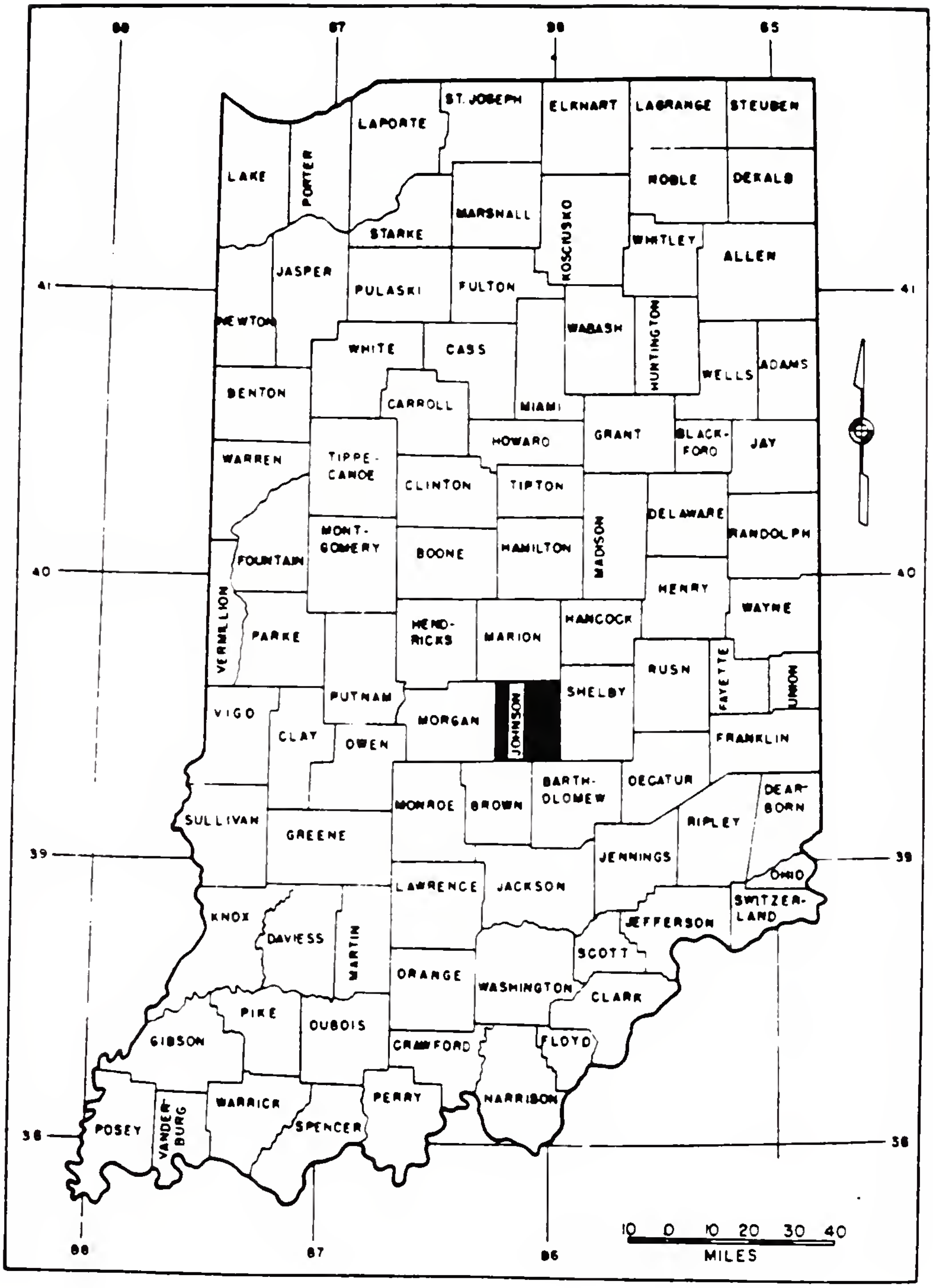


FIGURE 1. LOCATION MAP OF JOHNSON COUNTY

Table 1. Population Summary of Johnson County (3)

| | Population | | Population Change (1970-1980) | |
|---|---|---|---|---|
| City-Town | 1980 Census | 1970 Census | Difference | % Change |
| Bergersville | 1647 | 873 | 774 | 88.66 |
| Edinburg | 4856 | 5079 | -223 | -4.39 |
| Franklin | 11563 | 11477 | 86 | 0.75 |
| Greenwood | 19327 | 11869 | 7458 | 62.84 |
| New Whiteland | 4502 | 4200 | 302 | 7.19 |
| Princes Lakes | 937 | 597 | 340 | 56.95 |
| Trafalgar | 466 | 457 | 9 | 1.97 |
| Whiteland | 1956 | 1492 | 464 | 31.10 |
| Urban Areas | 45254 | 36044 | 9210 | 25.55 |
| Rural Areas | 31986 | 25094 | 6892 | 27.46 |
| County Total | 77240 | 61138 | 16102 | 26.34 |

livestock are hogs and beef cattle (1). The acreage percentage of farmland has decreased in recent years, but the average farm size has increased.

## CLIMATE

The climate of Johnson County is humid and continental. The cool Canadian air masses with alternating tropical air masses from the south bring changes in climate within days (1). Table 2 and 3 give data on temperature and precipitation for this area as recorded at New Whiteland and Franklin, Indiana, respectively. Temperature over a 27-year period ranged from -17$^0$ to 104$^0$F. About 32 days per year have temperatures of 90$^0$ or higher, and on 23 days a year the temperature does not rise above 32$^0$. In July, the average daily maximum temperature is 88$^0$F, whereas in January the average daily minimum temperature is 21$^0$F (1). The annual precipitation is about 39.6 inches, and spring and early summer rainfall usually exceeds winter precipitation. Thunderstorms occur on about 44 days each year (1).

The average frost-free season is 184 days (11). Average seasonal snowfall is about 18 inches. The heaviest 1-day snowfall recorded was 9.5 inches on March 1, 1963. The average relative humidity is about 58 percent in summer, and 68 percent in the winter. The prevailing wind is from the southwest with the highest average wind speed, 11 miles per hour, occurring in the winter and spring(1).

## DRAINAGE FEATURES

The county is drained by 2 major river systems. A line drawn from just east of Greenwood to Bargersville and south to a point slightly east of Peoga divides the county into the two drainage areas. The western part is drained by the West Fork of White River, whereas the eastern part the county is drained by the East Fork of White River and its tributaries such as Sugar Creek and Youngs Creek. Stream dissection is more complete in the western and southwestern parts than elsewhere. Some stream

## Table 2. Climatological Summary For Johnson County ( 4 )

Temperature in °F ; Precipitation in inches

Monthly statistics at New Whiteland

| | | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1978 | TMAX | 24.6 | 26.5 | 41.5 | 63.9 | 69.9 | 83.4 | 85.3 | 83.2 | 82.3 | 63.9 | 55.5 | 41.0 |
| | TMIN | 6.1 | -1.0 | 24.4 | 40.0 | 48.3 | 59.2 | 61.9 | 60.1 | 53.5 | 36.0 | 32.4 | 21.9 |
| | PREC | | | 3.09 | 3.81 | 4.50 | 6.41 | 6.71 | 4.80 | 0.54 | 2.69 | 2.66 | 2.53 |
| | SNOW | | | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| 1979 | TMAX | 25.4 | 27.3 | 51.6 | 59.6 | 73.2 | 83.0 | 83.1 | 82.1 | 79.5 | 65.4 | 52.4 | 42.8 |
| | TMIN | 5.5 | 1.8 | 30.7 | 39.0 | 47.3 | 59.1 | 62.3 | 61.0 | 51.1 | 41.7 | 30.3 | 23.5 |
| | PREC | 3.85 | 1.49 | 2.53 | 4.26 | 3.74 | 4.93 | 12.03 | 8.61 | 0.65 | 2.38 | 4.94 | 2.85 |
| | SNOW | 18.0 | 14.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.0 |
| 1980 | TMAX | 35.8 | 32.2 | 44.7 | 59.5 | 75.0 | 81.1 | 89.3 | 88.6 | 81.6 | 65.0 | 51.2 | 40.4 |
| | TMIN | 18.8 | 10.7 | 24.1 | 36.9 | 51.2 | 56.8 | 64.9 | 64.2 | 54.1 | 35.6 | 27.9 | 21.5 |
| | PREC | 1.47 | 2.15 | 4.36 | 2.40 | 2.78 | 4.06 | 3.57 | 6.73 | 2.43 | 2.21 | 1.28 | 1.06 |
| | SNOW | 0.5 | | 2.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 1.5 |
| 1981 | TMAX | 32.6 | 41.3 | 49.5 | 68.0 | 69.3 | 83.6 | 84.7 | 83.2 | 75.7 | 64.1 | 54.7 | 35.8 |
| | TMIN | 12.0 | 18.8 | 27.6 | 43.4 | 47.7 | 61.4 | 64.4 | 60.5 | 51.8 | 37.4 | 29.7 | 17.4 |
| | PREC | | 3.17 | 1.80 | 6.18 | 10.11 | 3.52 | 5.02 | 3.01 | 2.32 | 2.26 | 1.39 | 2.61 |
| | SNOW | 2.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 13.0 |
| 1982 | TMAX | 29.7 | 35.0 | 51.0 | 57.8 | 81.9 | 78.9 | 86.5 | 83.6 | 77.3 | 70.2 | 53.9 | |
| | TMIN | | 14.5 | 28.1 | 37.0 | 55.1 | 55.8 | 63.9 | 58.0 | 52.0 | 40.3 | | |
| | PREC | 3.39 | 0.87 | 5.61 | 2.15 | 4.63 | 3.29 | 3.12 | 2.48 | 1.01 | 0.91 | 3.96 | |
| | SNOW | 13.0 | 10.0 | 1.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1983 | TMAX | 37.5 | 46.4 | 53.1 | 58.1 | 71.6 | 85.7 | 90.9 | 90.4 | 82.8 | 67.5 | 55.4 | 27.8 |
| | TMIN | 21.1 | 22.3 | 31.0 | 38.7 | 47.2 | 59.9 | 64.8 | 63.1 | 50.2 | | | 14.0 |
| | PREC | 1.13 | 0.83 | 2.19 | 6.23 | 4.33 | 3.19 | 1.63 | 3.16 | 0.78 | 6.37 | 5.66 | 2.98 |
| | SNOW | 1.0 | | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.6 |
| 1984 | TMAX | 31.0 | 45.0 | 39.4 | 59.2 | 68.9 | 85.0 | 82.3 | 85.0 | 75.6 | 68.7 | 50.3 | 46.5 |
| | TMIN | 12.9 | 27.2 | 24.1 | 40.8 | 49.1 | 63.9 | 60.0 | 61.7 | 52.8 | 49.9 | 30.1 | 29.3 |
| | PREC | 0.51 | 1.43 | 2.76 | 5.24 | 4.32 | 2.24 | 2.33 | 1.15 | 3.72 | 3.27 | 4.98 | 4.90 |
| | SNOW | 7.6 | 11.0 | 6.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.0 | 3.0 |
| 1985 | TMAX | 27.8 | 32.9 | 54.2 | 68.1 | 74.1 | 78.3 | 83.7 | 80.4 | 77.8 | 67.4 | 54.3 | 32.2 |
| | TMIN | 11.8 | 13.4 | 33.5 | 45.4 | 53.8 | 59.0 | 62.2 | 60.8 | 54.1 | 46.1 | 38.8 | 14.0 |
| | PREC | 1.06 | 2.95 | 6.53 | 2.06 | 4.17 | 4.75 | 3.55 | 7.00 | 1.47 | 2.40 | 8.21 | 2.31 |
| | SNOW | 4.8 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.0 |
| 1986 | TMAX | 36.9 | 38.5 | 52.2 | 66.8 | 72.5 | 82.1 | 86.3 | 81.6 | 80.0 | 64.6 | 47.3 | 37.7 |
| | TMIN | 17.3 | 22.9 | 31.2 | 42.0 | 53.7 | 62.5 | 66.0 | 57.1 | 57.3 | 44.8 | 31.3 | 25.0 |
| | PREC | 1.08 | 3.94 | 2.75 | 3.75 | 5.51 | 2.41 | 3.94 | 2.10 | 4.85 | 4.09 | 1.98 | 2.22 |
| | SNOW | | 7.0 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1987 | TMAX | 34.0 | 42.8 | 54.1 | 62.3 | 80.1 | 83.6 | 84.8 | 84.7 | 81.2 | 60.3 | 56.7 | 41.6 |
| | TMIN | 20.2 | 24.7 | 32.5 | 40.1 | 54.9 | 62.2 | 65.0 | 62.2 | 53.9 | 34.2 | 34.3 | 28.6 |
| | PREC | 1.34 | 0.30 | 2.90 | 3.31 | 2.03 | 4.77 | 7.73 | 0.44 | 0.75 | 1.59 | 2.89 | 4.93 |
| | SNOW | 3.0 | 2.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1988 | TMAX | 33.0 | 35.2 | 50.3 | 62.5 | 77.1 | 86.3 | 87.7 | 87.1 | 77.3 | 58.2 | 51.5 | 39.6 |
| | TMIN | 14.4 | 17.5 | 30.0 | 39.0 | 49.6 | 57.0 | 62.6 | 63.0 | 52.6 | 33.5 | 31.7 | 19.6 |
| | PREC | 1.48 | 3.86 | 3.09 | 4.03 | 1.26 | 0.72 | 5.38 | 2.69 | 1.94 | 2.86 | 5.23 | 2.45 |
| | SNOW | 0.8 | 3.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 6.0 |

Table 3. Thirty Four Year Normal Climate Data (1)
(Recorded in the period 1937-70 at Franklin, Indiana)

| For The Period 1937-70 | | | | |
|---|---|---|---|---|
| | Temperature (F) | | | Average Precipitation |
| MONTH | Average daily maximum | Average daily Minimum | Average | (inches) |
| January | 39 | 21 | | 2.8 |
| February | 42 | 24 | | 2.5 |
| March | 52 | 31 | | 3.6 |
| April | 65 | 41 | | 3.8 |
| May | 75 | 51 | | 4.5 |
| June | 84 | 61 | | 4.1 |
| July | 88 | 63 | | 3.8 |
| August | 86 | 61 | | 3.2 |
| September | 80 | 54 | | 3.1 |
| October | 69 | 43 | | 2.1 |
| November | 53 | 32 | | 3.3 |
| December | 41 | 23 | | 2.8 |
| Annual | 65 | 42 | | ---- |

courses appear to have been influenced by the presence of the moraines. They are deflected and have increased densities of drainage patterns (5). Local watershed divides tend to follow the crests of sections of ridge moraines. Some of them are broad and nearly level (5). The drainage features of Johnson County are shown in Figure 2.

## WATER SUPPLY

Johnson County lies entirely within the White River watershed and its East Fork subdivision (Figure 3). No natural lakes exist in the county, but ponds of various origins can be seen in some parts of the county (5).

The major water resource in Johnson County is groundwater (1). Johnson County is situated in the Southern Till Plain Section except the extreme southwestern corner, which is in Devonian and Mississippian siltstone and shales section (Figure 4).

The major aquifers in the Johnson County are the areas underlain by gravelly sand and sand along White River and Blue River, Sugar Creek, and the lower reaches of Hurricane Creek and Young Creek. For example, the city of Franklin obtains its water supply from wells in terraces and bottom lands along Hurricane Creek and Young Creek about a mile from the city. Wells in about the western one-third of the county are least productive and are usually seep wells. In this area, more and more ponds are being dug to supplement the water supply (1). The water use summary for Johnson County is shown in Table 4.

## PHYSIOGRAPHY

The State of Indiana can be divided into two areas. The northern potion, covered by glacial drift, belongs to the great Central Lowland province, whereas the unglaciated southern section belongs to the Low Plateau province. The central Lowland province in Indiana can be further subdivided into two portions. These are the Northern Moraine and Lake Region (characterized by lakes and lake-bed deposits), and the Tipton Till

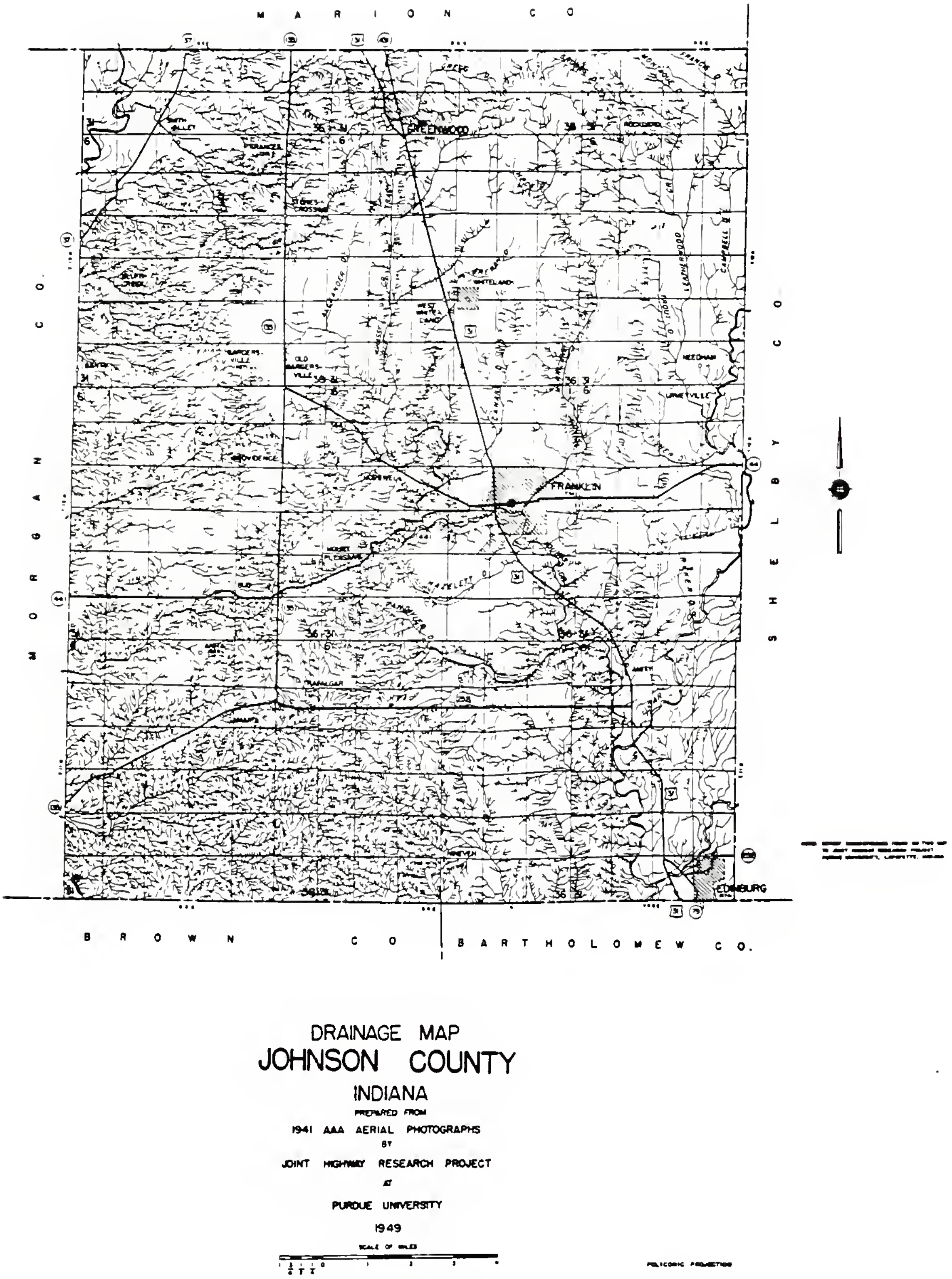


FIGURE 2. DRAINAGE MAP OF JOHNSON COUNTY ( 5 )

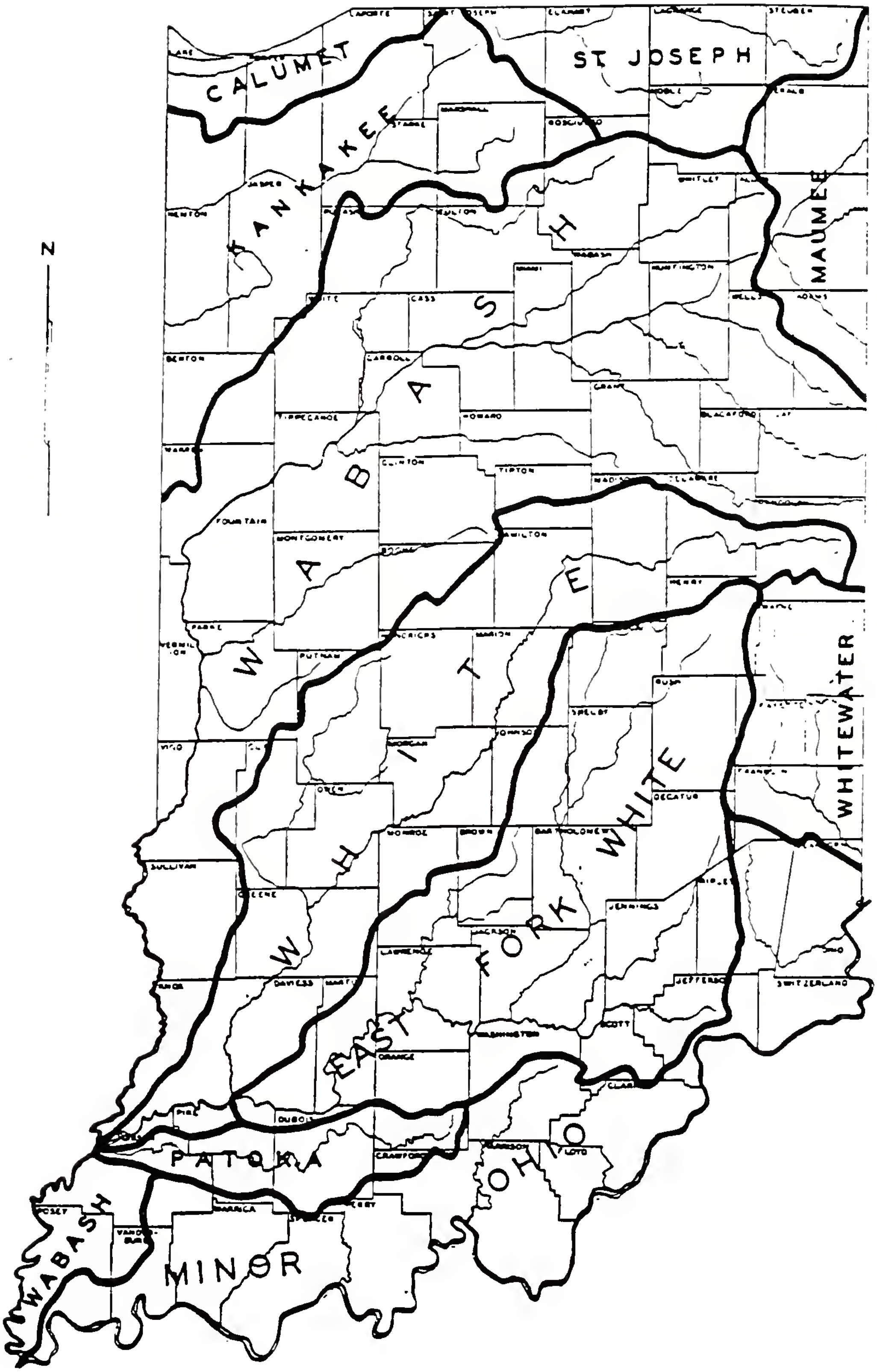


FIGURE 3. MAJOR WATERSHEDS OF INDIANA ( 6 )

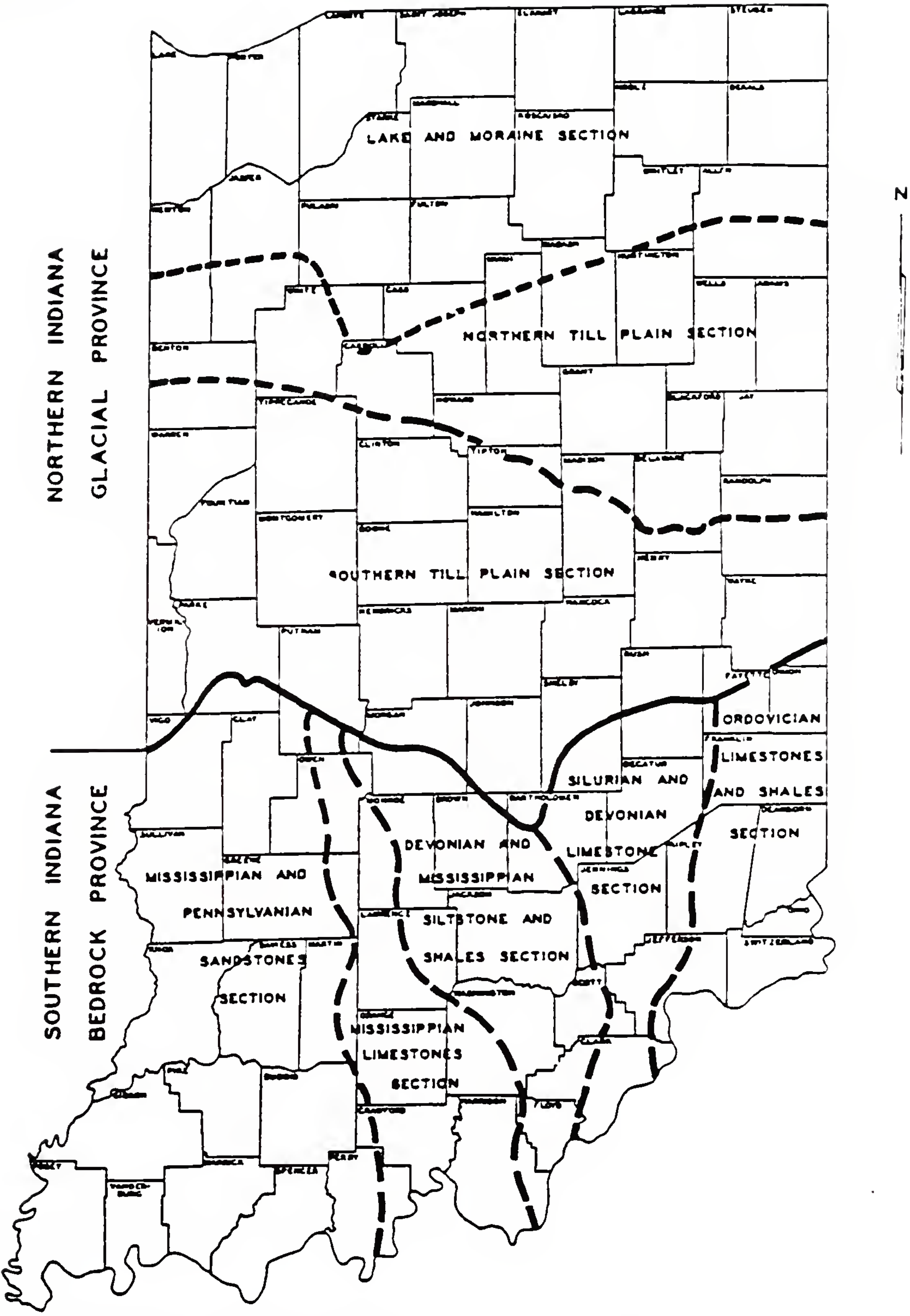

NORTHERN INDIANA GLACIAL PROVINCE
SOUTHERN INDIANA BEDROCK PROVINCE
N
LAKE AND MORAINE SECTION
NORTHERN TILL PLAIN SECTION
SOUTHERN TILL PLAIN SECTION
ORDOVICIAN LIMESTONES AND SHALES SECTION
SILURIAN AND DEVONIAN LIMESTONE SECTION
DEVONIAN AND MISSISSIPPIAN SILTSTONE AND SHALES SECTION
MISSISSIPPIAN AND PENNSYLVANIAN SANDSTONES SECTION
MISSISSIPPIAN LIMESTONES SECTION

FIGURE 4. GROUNDWATER SECTIONS OF INDIANA ( 6 )

Table 4. Water Use Summary for Johnson County (7)
(1989 usage in millions of gallons)

| MONTH | SOURCE | | |
|---|---|---|---|
| | Ground | Surface | Total |
| January | 245.29 | 0.00 | 245.29 |
| February | 214.21 | 0.00 | 214.21 |
| March | 258.08 | 0.00 | 258.08 |
| April | 255.70 | 0.00 | 255.70 |
| May | 288.96 | 1.64 | 290.60 |
| June | 317.88 | 1.42 | 319.30 |
| July | 320.58 | 1.84 | 322.42 |
| August | 301.15 | 1.42 | 302.57 |
| September | 266.26 | 0.94 | 267.20 |
| October | 283.42 | 1.10 | 284.52 |
| November | 243.33 | 0.46 | 243.79 |
| December | 260.43 | 0.00 | 260.43 |
| Total | 3255.30 | 8.82 | 3264.12 |

Plain (consisting of level or undulating deposits of drift without lakes or appreciable stream dissection) (8). On the other hand, the Low Plateau province can be subdivided into 7 divisions as shown in Figure 5. The northern part of Johnson County is located in the Tipton Till Plain, whereas the southern part is in the Scottsburg Lowland and Norman Upland physiographic regions (Figure 5).

The Tipton Till Plain, which includes more than three-fourths of the county, extends across the central potion of the state from east to west. It has more or less uniform topography compared with rugged and weathered southern Indiana. Since the region is monotonously flat; only an occasional break in topography can be seen resulting from small terminal moraines, knolls and kames (8).

In contrast to Tipton Till Plain, the southern one-fourth of the county has semi-rugged terrain. The Scottsburg Lowland is mostly nearly level to gently sloping terraces and outwash plains and nearly level river bottomland along Sugar Creek and Blue River, while the Norman Upland is characterized by gently sloping to moderately sloping, high, narrow ridgetops and strongly sloping to very steep, deep, V-shaped valleys.

## TOPOGRAPHY

The general topography of Johnson County is shown in Figure 6. The county has a variety of landforms. The surface varies from a gently undulating glacial till plain to an almost rugged stream dissected residual upland. Some depressions are found in the northeast and southwest part of the county. Depressed areas occur along Grassy, Hurricane and Youngs Creeks (5). The highest altitude reaches 1002 feet above sea level, which is an area on a high ridge west of Peoga. The lowest point is 635 feet above sea level. It is in the northeastern part of the county where the East Fork of White River leaves Johnson County and enters Morgan County. The maximum local relief is about 225 feet (5).

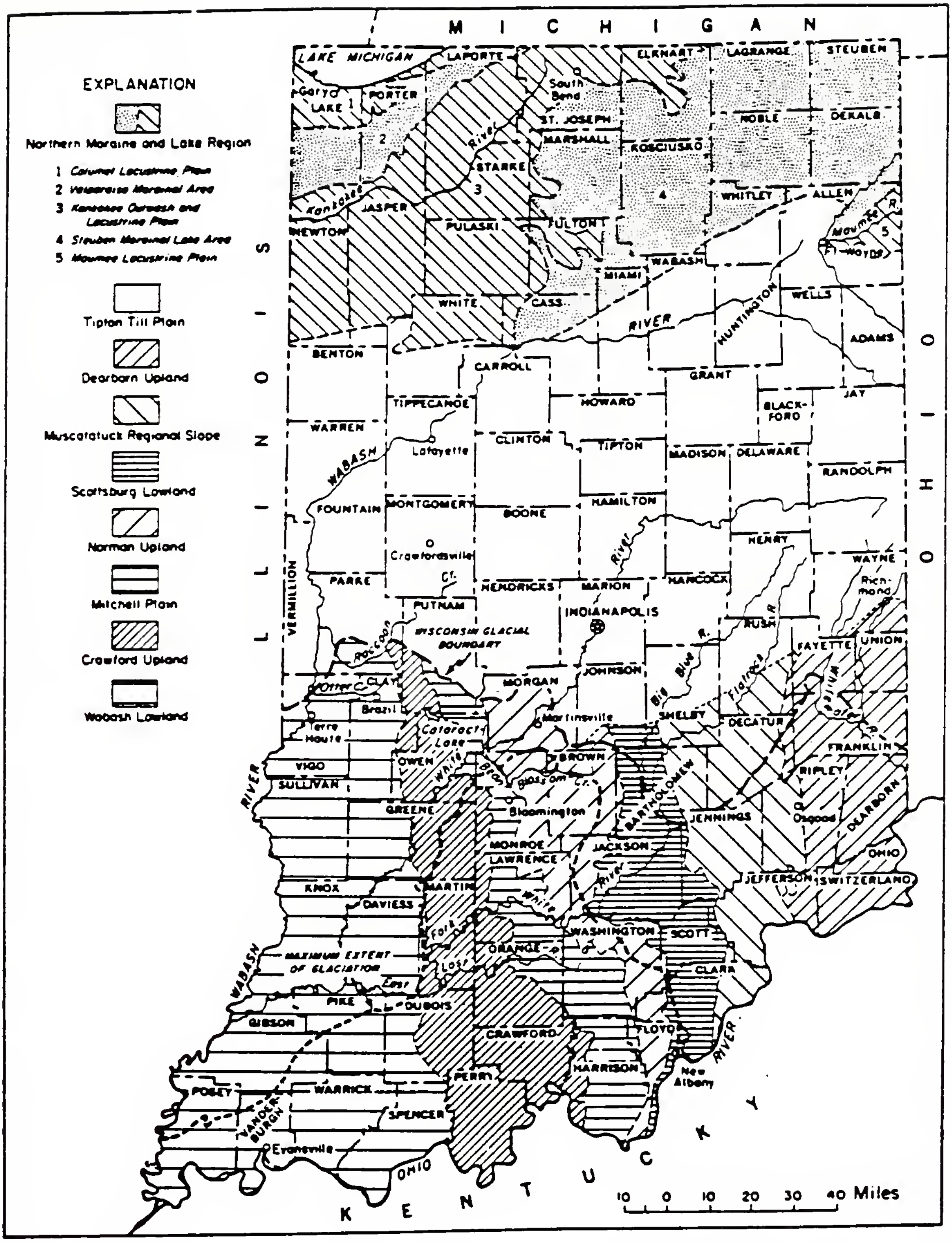


FIGURE 5. PHYSIOGRAPHIC UNITS AND GLACIAL BOUNDARIES IN INDIANA ( 9 )

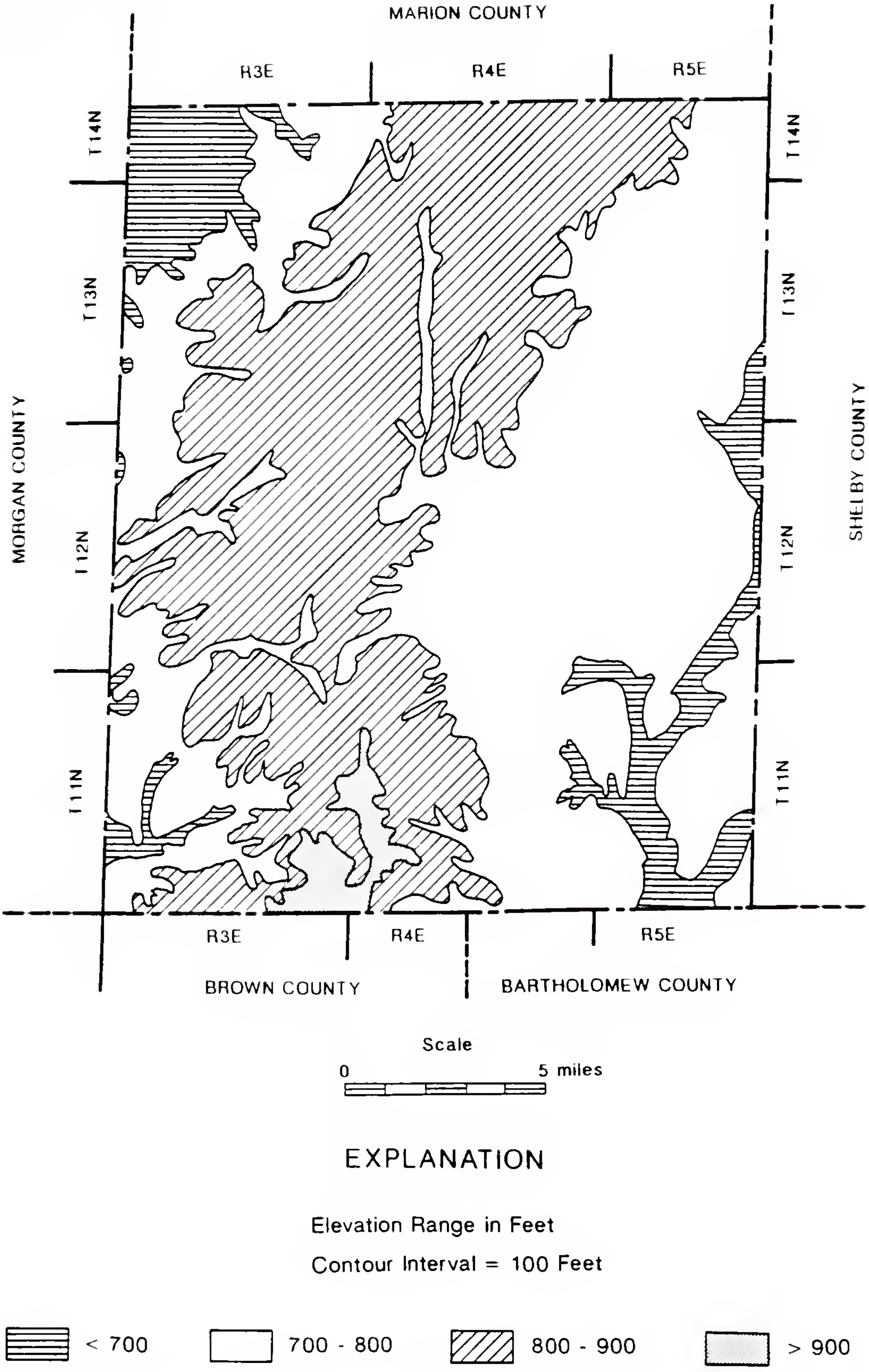


FIGURE 6. TOPOGRAPHIC MAP OF JOHNSON COUNTY (10)

## GEOLOGY OF JOHNSON COUNTY

Johnson County was completely glaciated and covered by glacial deposits left by the continental ice sheets. The surface drift in a small area in the southwestern part is Illinoian in age, whereas the remainder of the area is Wisconsin in age (5).

### GLACIAL GEOLOGY

Johnson County is located near the southernmost limit of the continental ice sheets which retreated from Indiana about 20000 years ago (11). As the glaciers retreated, a series of moraines were left behind. These moraines consist of sand, gravel, clay and silt. The present day thickness of these deposits ranges from a few feet to over 200 feet east of Greenwood in the county. Johnson County is crossed by 3 moraines--the Bloomington Morainic System in the north, the Champaign in the central, and the Shelbyville in the south part (5).

### BEDROCK GEOLOGY

The bedrocks in Johnson County are Devonian and Mississippian rocks. Figure 7 is a map of bedrock geology of Indiana. The map of bedrock geology of Johnson County is shown in Figure 8. The figure illustrates the disposition of the bedrock units as they would appear today if there were no unconsolidated deposits present to cover them.

The oldest bedrocks in Johnson County are Devonian rocks. They can be subdivided into Muscatatuck Group and New Albany Shale. The lower rocks, Muscatatuck Group, are made up of several kinds of carbonate and evaporite lithologies. The most common are limestone and dolomite (14). These rocks crop out under the glacial drift in the east-central and northeast edge of the county, but there is no surface exposures of them in Johnson County (11). The thickness of the Muscatatuck

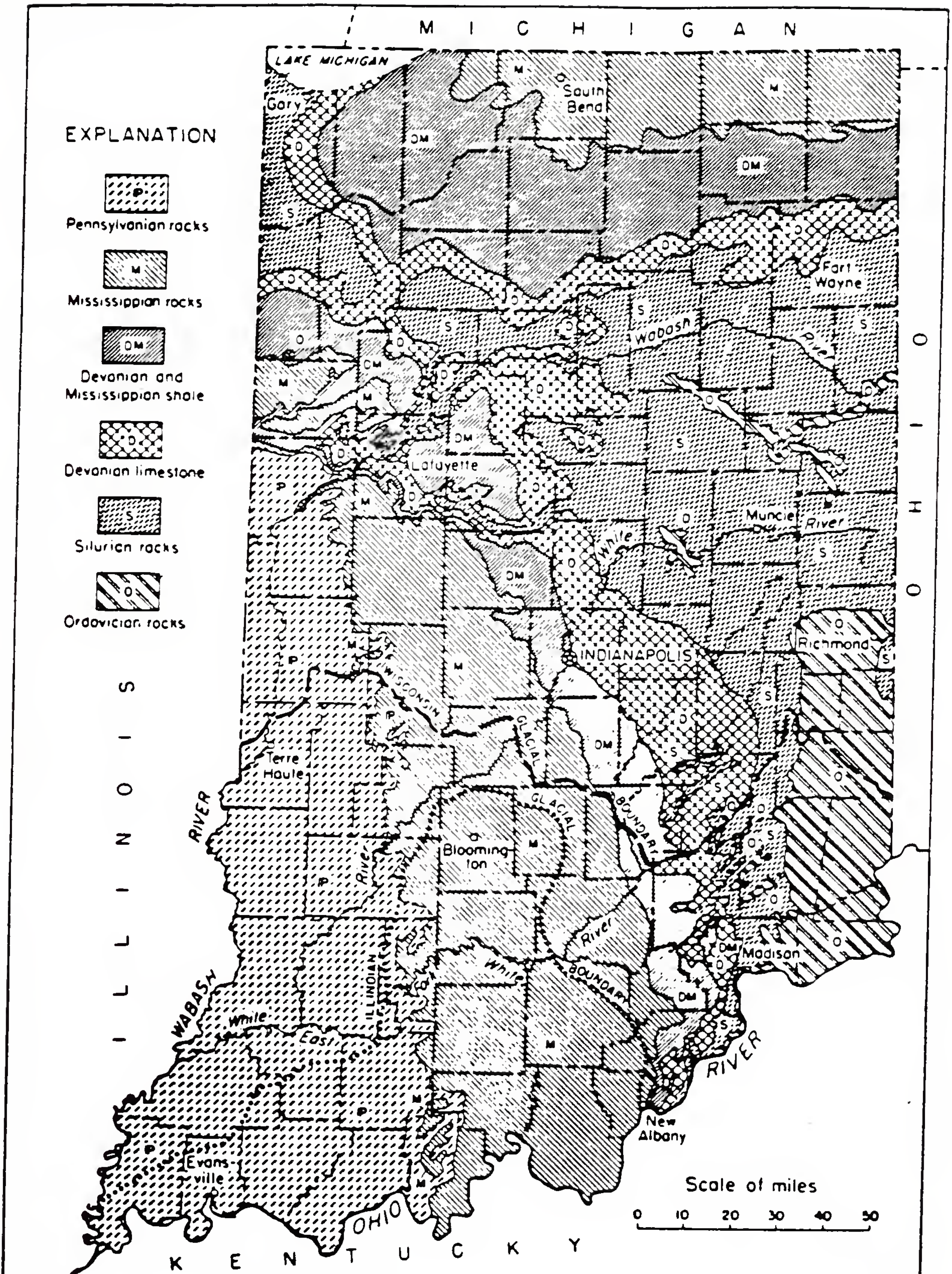


FIGURE 7. BEDROCK GEOLOGY OF INDIANA ( 12 )

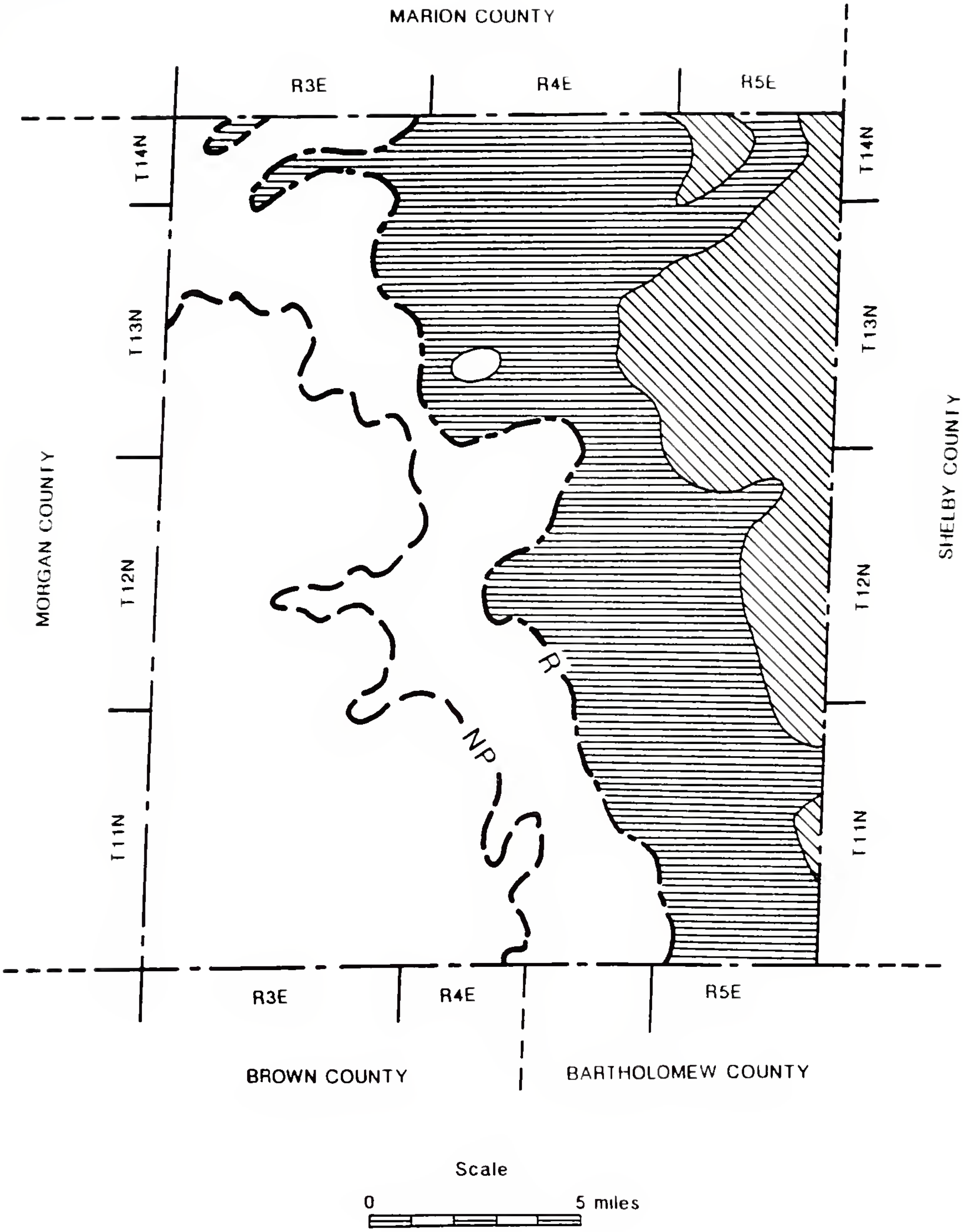


FIGURE 8. BEDROCK GEOLOGY OF JOHNSON COUNTY (13)

## EXPLANATION

| | | |
|---|---|---|
| Mississippian | — —NP— | Borden Group - Mostly siltstone; lenses of crinoidal limestone in upper part. Much cherty and silty limestone and dolomite in northwest. NP, top of new providence shale |
| | — —R— | Rockford Limestone - Thin micritic dolomite |
| Devonian | ▤ | New Albany shale - Black and greenish - gray shale |
| | ▨ | Muscatatuck Group - Limestone and dolomite |

FIGURE 8. BEDROCK GEOLOGY OF JOHNSON COUNTY ( CONTINUED )

Group ranges from erosional zero to more than 250 feet in the Illinois and Michigan Basins.

Except where affected by post-Devonian erosion, the Muscatatuck is overlain by the dark shales of the New Albany Shale in southern Indiana. The New Albany Shale is composed of brownish-black carbon-rich shale, greenish-gray shale, and minor amounts of dolomite and dolomitic quartz sandstone (14). The formation crops out at a spot along Sugar Creek near Amity, and in Blue River at Edinburg (11). There are five members recognized in the formation. They are the Blocher Member, the Selmier Member, the Morgan Trail Member, the Camp Run Member, and the Clegg Creek Member in ascending order. The thickness of the New Albany Shale ranges from 0 to 140 feet in Johnson county.

The Rockford Limestone, typically gray, fine grained, argillaceous, ferruginous, and sparingly fossiliferous, overlies the New Albany Shale. Limestone is dominant in the Rockford, but shale, siltstone, and dolomite are also present (14). The Rockford Limestone crops out beneath the glacial drift in a very thin belt extending from south to north. The thickness is commonly 2 or 3 feet as shown in Figure 8.

The Borden Group in turn rests on the Rockford Limestone. It is composed of three formations. They are the New Province Shale, the Spickert Knob, and Edwardsville Formations in ascending order. The three formations represent three major settings. The New Province Shale resulted from prodelta deposits, the Spickert Knob Formation from delta-slope deposits, and the Edwardsville from delta-platform deposits (14).

The Borden Group is composed dominantly of gray argillaceous siltstone and of shale. Fine-grained sandstone is common. Lenses of crinoidal limestone can be found in the upper part (14). The Borden crops out in many road cuts and streams banks in the western, southwestern, and southern portion of the county. It reaches a maximum thickness of at least 700 feet in Johnson County (11).

The bedrock topography of Johnson County is shown in Figure 9. The lowest bedrock altitude exists in the eastern part of the county, which corresponds to the Sugar Creek, Youngs Creek and their tributaries.

## PLEISTOCENE GEOLOGY

The Pleistocene sediments in Indiana are of continental origin rather than marine origin. Therefore, they are less homogeneous and continuous. The unconsolidated deposits encountered in Johnson County are illustrated in Figure 10. These sediments are of Wisconsinan and Illinoian ages.

The glacial drift is present at the surface throughout Johnson County except in most river valleys where it is overlain by deposits of present streams. Those materials deposits by earlier glaciers are not distinguishable at the surface now.

The Jessup Formation, which overlies the Borden Group rocks, is exposed as the surface unit in the southwestern part of the county. It consists of several beds of calcareous conglomeratic mudstone and intercalated lenses of clay, silt, sand, gravel, marl, and peat (18). These sediments were deposited on rocks of Paleozoic age by the Illinoian and older glaciers as they retreated. The thickness of the formation is extremely variable, because both upper and lower surfaces of the units are bounded by erosional unconformities (18). The weathering depth usually ranges from 3 to 4 meters if the formation is not covered by younger sediments (18).

Overlying the Jessup Formation is Trafalgar Formation. The Trafalgar Formation is named from the village of Trafalgar in Johnson County. The type section is exposed along Buckhart Creek about 2 miles east of Trafalgar and 500 feet north of Indiana State Highway 252. Tills of the Trafalgar Formation are most common as the surface unit in Johnson County as shown in Figure 10. They are primarily calcareous conglomeratic mudstones. Lenses of silt, sand, and gravel are also present in the Formation (18). Much of the area underlain by the formation is a relatively flat plain. Three

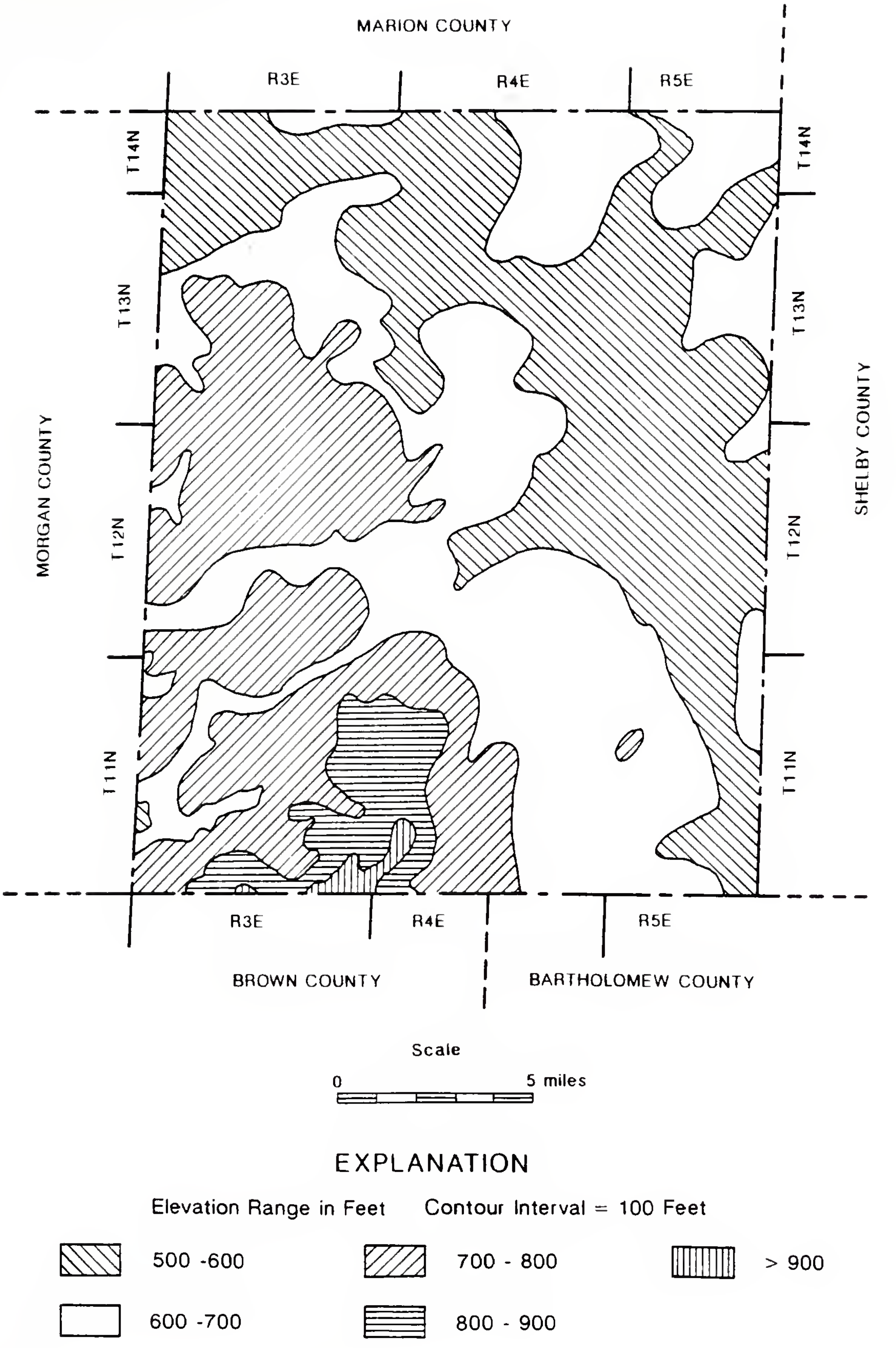


FIGURE 9. BEDROCK TOPOGRAPHY OF JOHNSON COUNTY (15)

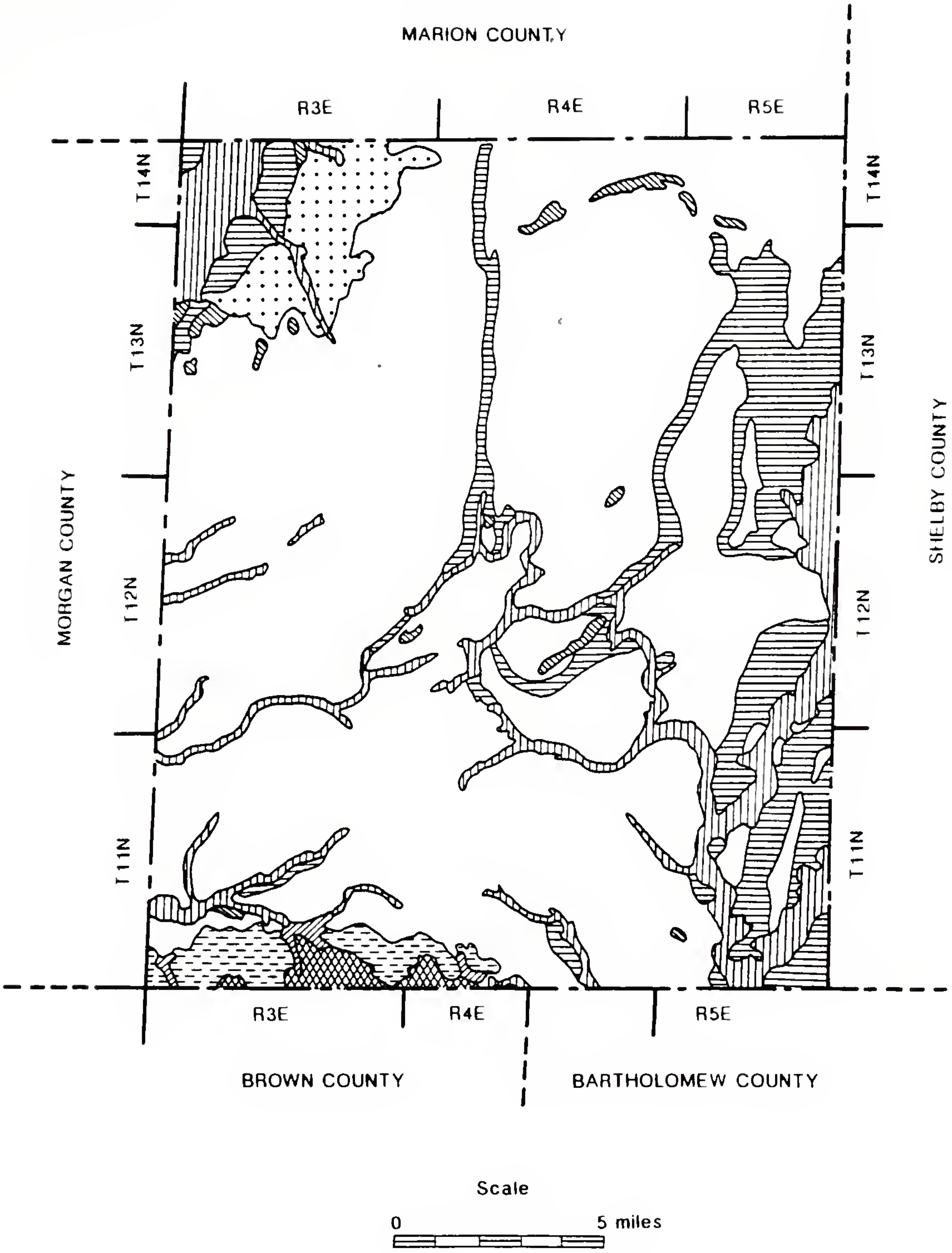


FIGURE 10. UNCONSOLIDATED DEPOSITS OF JOHNSON COUNTY (16,17)

# EXPLANATION

| | | | |
|---|---|---|---|
| Quaternary (pleistocene) | Wisconsinan and Holocene | ▥ | Silt, Sand and Gravel - Deposits of present streams; Includes associated slopewash and swamp deposits. Martinsville Formation in Indiana. |
| | Wisconsinan | ▤ | Gravel, Sand and Silt - Deposits of meltwater streams. Valley - Train deposits as partial valley fill. Atherton Formation in Indiana. |
| | | ▧ | Gravel, Sand and some Silt - Hummocky patches of ice - contact stratified drift. Kame and esker facies of Trafalgar Formation in Indiana. |
| | | ⬚ | Sand, Gravel and Till - Undifferentiated ice - contact stratified drift and till with hummocky topography. Part of Trafalgar Formation in Indiana. |
| | | □ | Till - Mostly loam till. Till sheets of low relief. Trafalgar Formation in eastern areas; Fairgrange and batestown Till Members of Wedron Formation in Western areas. |
| | Illinoian and Older | ⊟ | Till; Till, Sand, and Gravel - Mostly loam till as extensive blankets. Jessup Formation in most of Indiana; Glasford Formation in Illinois and parts of Western Indiana. |
| Mississippian | | ▩ | Borden Group and Rockford Limestone - Siltstone, Shale, Sandstone, and thin Limestone. |
| | | ▨ | Water body. |

FIGURE 10. UNCONSOLIDATED DEPOSITS OF JOHNSON COUNTY ( CONTINUED )

environmental facies can be recognized. They are blanket till, end-moraine till and kame facies.

The Trafalgar Formation is overlain by the Atherton Formation. The Atherton Formation is a deposit of gravel, sand, silt, and clay derived from glacial outwash. Four facies are identifiable as Atherton Formation. They are outwash facies, dune facies, loess facies and lacustrine facies.

The youngest sediment in Johnson County is the Martinsville Formation. It is deposited by the modern streams, small lakes and sloughs. Silt, sands, and gravels are most commonly found. The Martinsville Formation includes two facies. One is associated with flood plain deposition and referred as Alluvial facies, the other is essentially formed in still water and named Paludal facies (18). The Alluvial facies contains silt, sand, and gravel, and the Paludal is rich in organic matter. The Paludal facies is also highly fossiliferous. Peat in the Martinsville Formation, containing abundant plant remains but rare mollusks, exist in a few locations.

The thickness of unconsolidated deposits is shown in Figure 11. The unconsolidated deposits are thickest in the area of T. 13N., R. 4E., and T. 14N., R. 4E., where they are more than 200 feet thick. In general, the areas of thickest deposits correspond to those places where the underlying bedrock surface is relatively low as shown in Figure 9. The relationships between unconsolidated deposits are shown in Figure 12.

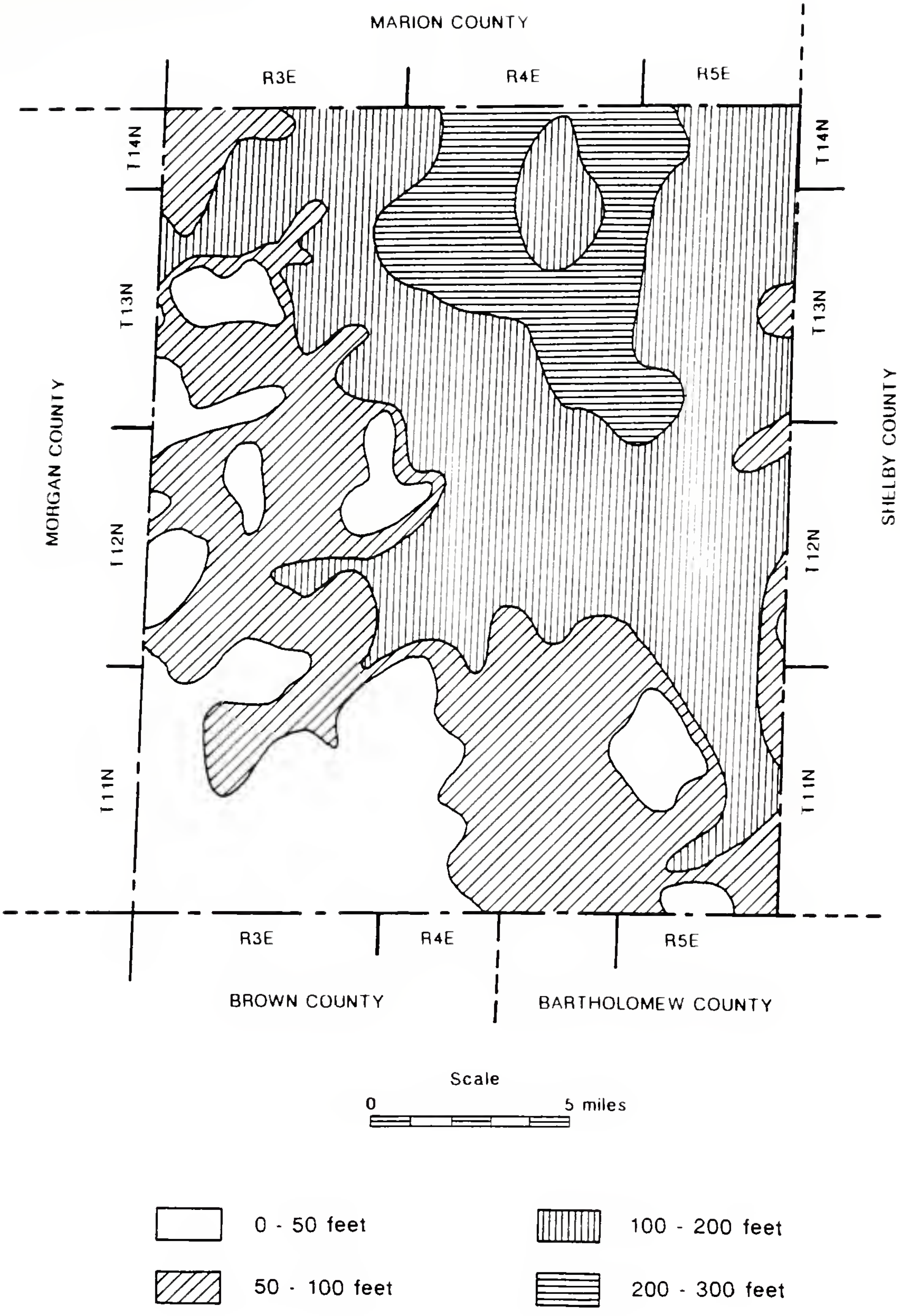
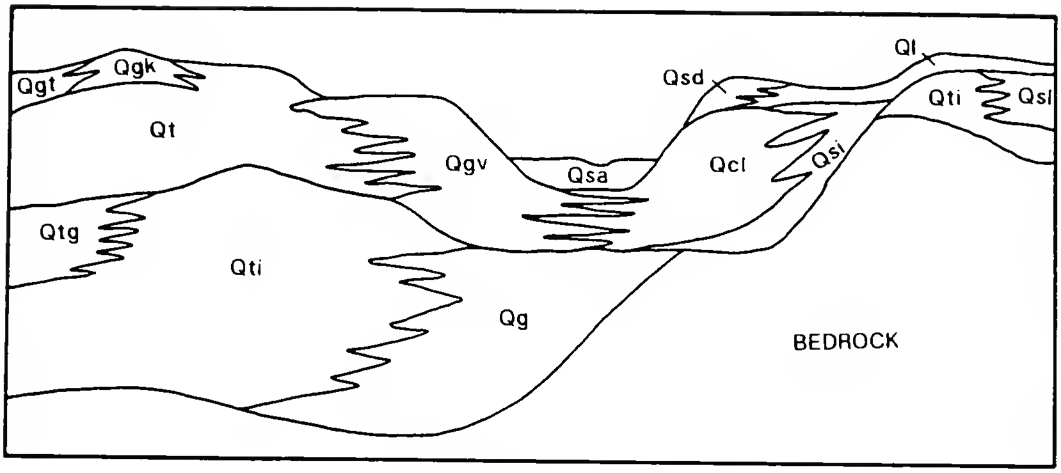


FIGURE 11. THICKNEES OF UNCONSOLIDATED DEPOSITS (19)



EXPLANATION

| | | | |
|---|---|---|---|
| Quaternary (pleistocene) | Wisconsinan and Holocene | Qsa | Silt, Sand, and Gravel |
| | | Qsd | Sand and some Silt |
| | Wisconsinan | Q1 | Silt, fine sand, and Clay |
| | | Qc1 | Clay, Silt, and Sand |
| | | Qgv/Qgp | Gravel, Sand, and Silt |
| | | Qgk | Gravel, Sand, and some Silt |
| | | Qgt | Sand, Gravel, and Till |
| | | Qt/Qte | Till |
| | Illinoian and Wisconsinan | Qsi | Silt, Clay, and Gravel |
| | Illinoian and Older | Qs1 | Silt, Clay, and fine Sand |
| | | Qg | Gravel and Sand |
| | | Qti/Qtg | Till; Till, Sand, and Gravel |

FIGURE 12. SCHEMATIC SECTION SHOWING RELATIONSHIPS OF UNCONSOLIDATED DEPOSITS (16,17)

# LANDFORM-PARENT MATERIAL REGIONS

The soils of Johnson County are primarily composed of unconsolidated sediments, such as clays, sands, and gravels. These soils are mapped into five groups and associated subgroups for the engineering purpose. The four parent material units are glacial drift, glacial-fluvial drift, fluvial drift, residual soils, and cumulose drift.

Each of the landform-parent material regions is characteristically identified by its surface texture, overall extent, and soil profiles. Available boring log data are collected in Appendix A. Classifications of the soils according to the American Association of State Highway and Transportation Officials (AASHTO) system are given along with the textures in terms of the designation adopted by the U.S. Department of Agriculture. In addition, the physical, chemical and engineering properties of the soils are summarized in Appendices B and C. Finally, Appendix E provides correlation charts and formulas for estimating soil properties based on their index parameters such as plasticity index and liquidity index.

The engineering considerations for each parent material unit are discussed here. For specific and detailed information, the reader should consult the boring reports listed in the references. This report only provides general information, and is not intended to replace site investigation for any engineering project.

## GLACIAL DRIFT

Ice of Wisconsin age had a profound effect on the surficial geology of Johnson County (20). The majority of the area in Johnson County is covered by glacial drift, which is composed of soils with broad range of grain sizes.

## Glacial Till

Glacial till is a poorly sorted mixture of gravel, sand, silt, and clay. These sediments are deposited by Wisconsinan and Illinoian glaciers. The surface is level to gentle rolling, sometimes broken by river courses or low knolls. Sections of three morainic systems cross the county from east to west. They are the Shelbyville in the south, the Champaign in the central, and the Bloomington in the northern part (11). Moraines are likely to be poorly drained, C-type gullies and V-type gullies can be found. The former is an indication of soils rich in clay or silty clay, whereas the latter is common in coarsed-grained soils such as sand and gravel (21-24).

The general soil profile in glacial till usually consists of clay, clay loam, silty clay, silty clay loam, or loam, underlain by subsurface soils of sandy loam, silt loam, clay loam, silty clay, or loam. Among these soils, the thickness of silty clay and loam may be as large as 9 feet.

The agricultural soils that form on glacial till are Brookston, Crosby, Fincastle, Hennepin, Hickory, Miami, Muren, and Parke series. Soil boring numbers 1-86 and 94-102 are located in glacial till.

## Engineering Considerations in Glacial Drift

The typical engineering properties of glacial drift are poor drainage, low permeability and susceptibility to frost action.

Frost action will cause the volume of the soil to expand 10% or more upon freezing. The expansion is usually not uniform, thus causing serious damage to highway pavements and structures. Moreover, during the spring thaw the water content in the soil is increased by the melted ice lenses. This will weaken the soil and create additional damage to the pavements (25).

To avoid frost action, the material under highway should be drained and granular, usually not more than 3 percent of the material can be less than 0.02 mm in

diameter. Utilities lines and building footings should be placed well below the frost line (26).

Another highway pavement problem is pavement pumping at pavement joints. Pumping is common to rigid pavements over ground moraine (23). Usually soil particles are carried out from beneath the pavement by the ejection of water due to traffic loading (8). Thus, cavities are formed underneath the pavements and cracking and faulting follow. Again, pumping is restricted to poorly drained areas. The damage can be reduced by replacing the fine-grained soils by drained granular ones.

The soils on glacial drift usually have high water contents. Therefore, it may be difficult to compact the soil to required levels. If too great a compaction energy is applied, the soil will actually become weaker. This is called overcompaction (25). It is recommended to remove all wet and soft surface soils before construction of the roadways, and backfill to an elevation above the groundwater table if groundwater is encountered.

However, glacial till can be used as a fill material under certain conditions. Its high clay content makes it almost impermeable to water. Therefore, it can be used as the core of earth dam or fill material for underground cavities where subsurface drainage is a problem (20).

## GLACIAL-FLUVIAL DRIFT

Outwash plains and terraces is the only recognized division of glacial-fluvial drift in Johnson County.

### Outwash Plains and Terraces

Outwash plains and terraces occupies the second largest portion of the county. The outwash plains are broad plains formed by meltwater currents flowing from the glacier, and the terraces are developed from valley trains, which are also formed along

major drainage ways during glacial ages. They are grouped together due to their close relationship during deposition. The soils, consisting of silt, sand, and gravels, are highly stratified. The soils are also affected by the erosion and deposition actions of modern streams because the streams sometimes flow in abandoned channels of outwash plains (22, 27). A large quantity of sand and gravel as outwash material are found near Sugar Creek and the Big Blue River. These deposits are promising sources of sand and gravel (20).

The soils encountered in outwash plain are silt loam, clay loam, silty clay loam, and loam, underlain by clay loam, sandy clay loam, sandy loam, loam and sand.

No soil borings were made in outwash plains and terraces. The agricultural soils that form on this division are Fox, Nineveh, Ockley, Rensselaer, Sleeth, Westland, and Whitaker series.

### Engineering Considerations in Glacial-Fluvial Drift

The textures of outwash deposits are usually medium to coarse-grained, and segregated into distinct phases. In general, the outwash plain provides adequate support for light to moderately loaded buildings in the sandy phase (27). Also, it is a good potential source for construction materials such as sand and gravels.

The permeability of the soils are high. This should be taken into account when planning sanitary facilities and landfill sites.

For terraces, high potential of erosion is the major engineering problems, especially on the side slopes. Circular types of slope failure are common after heavy rainfall.

## FLUVIAL DRIFT

Fluvial drift appears in only one landform in Johnson County. It is the flood plain.

## Flood Plain

Flood Plains are distributed along White River system in Johnson County. All of them are narrow and restricted in aerial extent. The flood plains are formed as a result of modern stream deposition and become a veneer of outwash material (20). The thickness of flood plains range from 0 to 20 feet along Sugar Creek, Big Blue River, Herriotts Creek, and Youngs Creek (20).

The soil profile of flood plains varies from place to place. The soils in the profile include loam, clay loam, sandy loam, sand, silty clay loam, sandy clay loam, and silt loam.

Soil borings located in flood plain were numbers 87-93 and 103-126. The agricultural soils that form on this landform are Eel, Genesee, Ross, Shoals, and Sloan series.

## Engineering Considerations in Fluvial Drift

Fluvial deposits are usually layered and highly variable (27). The permeability in the horizontal direction tends to be much greater then the vertical direction. Furthermore, the permeabilities in the surface layers are usually lower compared with the sublayers. Flooding, differential settlements and low shear strength are greatest concerns in the flood plain. Flood plains are not suitable for sanitary landfill sites, either. This is due to the possibilities of flooding and ground water contamination.

The ground water table is close to the surface in flood plains. This makes excavation difficult. A dewatering scheme is recommended.

## RESIDUAL SOILS

The residual soils in Johnson County are developed from the decomposition of rocks such as sandstone, shale, and siltstone. They constitute the surface soils or near-

surface soils for southwestern parts of the county, where the bedrocks outcrop. The thickness of these residual soils is highly variable.

### Residuum Developed from Interbedded Sandstone, Siltstone and Shale

Small areas of residuum of sandstone, shale, and siltstone are found in the southwest corner, which are very likely derived from rocks of the Borden Group.

This map unit makes up small percentage of the county. The soils in this area are generally unsuited to sanitary facilities and dwellings. Typically, the surface layer is silt loam or loam. The subsoils consist of silt loam, silty clay loam, clay loam, and loam.

The agricultural soils that form on the sandstone, shale and siltstone residuum are Muskingum and Wellston series.

No borings were located in this region.

### Engineering Considerations in Residual Soils

The residual soils, either derived from sandstone or shale, are susceptible to weathering. In southern Indiana, the residual soils developed from limestone and shale are relatively deep, and it is seldom that the unweathered rock formations are within 10 feet of the ground surface. However, chert fragments are present in these residual soils at almost every location and depths.

In the sandstone-shale area, care should be taken on fill material of embankment in highway construction. Shale fragments are unsuited because of their low slaking durability and difficulty in compaction. A mixture of sandstone and shale fragments is also unfavorable.

## CUMULOSE DRIFT

Cumulose drift occurs in the form of organic deposits in Johnson County.

### Organic Deposits over Mineral Material

Organic Deposits (muck basins) are deposits associated with muck and highly organic matter. The sizes of muck basin are small and limited in number in Johnson County. Some of them are distributed just east of the town of Amity. The thickness of muck varies. Usually, the surface layer is highly organic material, underlain by silt loam and sandy loam.

No soil boring reports are available for muck basins at the time of preparing this report. The agricultural soil that forms on muck basins is Palms series.

### Engineering Considerations in Cumulose Drift

The characteristics of muck basin are high organic content, high water content, high porosity, high compressibility, low permeability, and low strength. Therefore, the muck basin is unsuited for roads or buildings. Usually, constructions on muck basins are avoided. However, if economically feasible, the soils in muck basin can be replaced by soils with adequate engineering properties.

## MISCELLANEOUS

### Gravel Pits

Johnson County has commercially valuable deposits of sand and gravel. In fact, eastern Johnson County has large sand and gravel deposits which can supply aggregate necessary for the future expansion of Indianapolis and adjacent areas (20). A few gravel pits exist in the area due to the construction of Interstate Highway 65. Other areas producing sands and gravels are located in the northwestern and northern parts (5). Each year a vast amount of sand and gravel is used in construction projects such as highways, bridges, foundations, and buildings. Sand and gravel are classified according to their grain sizes. Loosely speaking, the coarse-grained soil with particle

size greater than 2 mm are termed gravels, whereas sand is defined as soils with grain size less than 2mm.

Gravel has been found along major streams. Some wind-deposited sands are found in the White River valley (5).

## SUMMARY OF ENGINEERING CONSIDERATIONS IN JOHNSON COUNTY

Table 5 is the summary of engineering considerations for different landform-parent material regions in Johnson County. Each landform-parent material and its associated engineering problems are included in the table. However, the ranking shown in the table is recommended to be used as a general guideline only. Site specific investigation is always needed.

Sometimes a rough estimate of soil properties such as preconsolidation pressure and undrained shear strength is needed from available data in the preliminary stage of site investigation. These existing data are usually index parameters such as the liquid limits and plastic limits contained in Appendix A. Therefore, correlations between index parameters and engineering properties of soils are needed. There are many correlations existing in the literature, and some of them are summarized in Appendix E. These charts and formulas are intended to give engineers a feel about soil properties before performing more sophisticated soil tests. For more correlations such as those between in-situ tests and soil properties, reader can refer to reference 36.

Table 5. Summary of Engineering Cosiderations for Landform-Parent Material Regions in Johnson County.

EXPLANATION

PROBABILITY OF A MAJOR PROBLEM DEVELOPING
L (LOW)
M (MEDIUM)
H (HIGH)

AVAILABILITY RATING
1 (LOW)
2 (MEDIUM)
3 (HIGH)

| LANDFORM | GENERAL SOIL TEXTURE | CUT DESIGN | | | | | EMBANKMENT FILLS | | | | | EMBANKMENT FOUNDATION | | | | SUBGRADE | | | | FOUNDATION DESIGN | | | | | | | | MISCELLANEOUS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | COMPACTED PROPERTIES | | | | | | | | | | | | | SHALLOW FOOTINGS | | | PILES | | | | | | | | | |
| | | SOIL/ROCK BACKSLOPE INSTABILITY | GROUND WATER CONTROL | EROSION POTENTIAL | SURFACE DRAINAGE | NATURAL SLOPE AND RIVER BANK INSTABILITY | EROSION RESISTANCE | RELATIVE PERMEABILITY | INADEQUATE SHEAR STRENGTH | COMPRESSIBILITY WHEN SATURATED | WORKABILITY PROBLEMS | INADEQUATE SHEAR STRENGTH | EXCESSIVE SETTLEMENTS | ORGANIC DEPOSIT OCCURENCE | GROUNDWATER CONTROL | SUBGRADE SUPPORT INADEQUATE | FROST ACTION POTENTIAL | PUMPING POTENTIAL | SHRINK-SWELL POTENTIAL | INADEQUATE BEARING CAPACITY | EXCESSIVE SETTLEMENT POTENTIAL | SCOUR POTENTIAL | INADEQUATE BEARING CAPACITY | EXCESSIVE SETTLEMENT POTENTIAL | NEGATIVE SKIN FRICTION | SCOUR POTENTIAL | ESTIMATION OF LATERAL EARTH PRESSURES FOR RETAINING STRUCTURES | AVAILABILITY OF AGGREGATE | STEEL CORROSIVITY | CONCRETE CORROSIVITY | BEHAVIOR OF SEPTIC TANK FIELDS | GROUNDWATER RESOURCE POTENTIAL |
| glacial till | silt, clay, sand | M | L/H | M | L | M/H | M | 1-2 | M/H | M/H | H | H | M | L/M | L/M | H | L/M | NA | L | H | M/H | M | L | L | NA | M | HA | 1 | NA | NA | M/H | 1 |
| outwash plains & terraces | silt, clay, sand | H | M/H | H | L | H | L | 2 | M/H | M | L/M | M | M | M | M/H | M | M/H | L/M | M/H | H | M | M/H | L | L | L/H | M/H | NA | 1-2 | L/M | M | M/H | 1 |
| flood plain | silt, sand, clay | M/H | M/H | H | L | M/H | L/M | 3 | L/H | H | L/M | L/H | H | M | M/H | L/H | M/H | M | L | H | H | M/H | L | L | L7H | M/H | NA | 1 | L/M | M | M/H | 1-2 |
| sandstone residuum | silt, clay, sand | M/H | M | H | L/M | M/H | L | 1-2 | M/H | H | H | M/H | H | L | L/M | M | M/H | M/H | L/H | M/H | M | M/H | L | L | H | M/H | NA | 1 | L/M | L/M | M/H | 1 |
| organic deposits | muck, marl | M | H | H | H | L | L | 1 | H | H | H | H | H | H | L | H | H | H | H | H | H | H | M/H | H | M/H | H | H | NA | H | H | H | 1 |

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# APPENDIX A

## CLASSIFICATION TEST RESULTS FOR SELECTED ENGINEERING PROJECTS IN JOHNSON COUNTY (28-34)

Appendix A1:

Borehold data for I-65 boundary between Johnson and Marion Counties.

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD % | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 1 |  | 1 | 1236+00 | CL | 828.6 | 0.0-1.0 | clay loam | A-4(5-8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 1.0-3.0 | clay | A-6(12) | -- | -- | 0 | 18 | 37 | 45 | 39 | 18 | 21 |
|  |  | 3 | " | " | " | 4.5-6.0 | " | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2 |  | 1 | 1240+00 | CL | 830.0 | 0.0-1.2 | clay loam | A-4(5-8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 1.2-2.6 | clay | A-6(11-16) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 2.6-4.5 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 4 | " | " | " | 4.5-6.0 | silty clay loam | A-4(8) | -- | -- | 0 | 13 | 57 | 30 | 22 | 17 | 5 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3 |  | 1 | 1245+00 | CL | 834.1 | 0.0-0.8 | clay loam | A-4(5-8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 0.8-2.6 | clay | A-7-6(8-15) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 2.6-5.0 | clay loam | A-4(4) | -- | -- | 10 | 34 | 34 | 22 | 20 | 14 | 6 |
|  |  | 4 | " | " | " | 5.0-6.0 | " | " | -- | -- | 5 | 38 | 36 | 21 | 17 | 15 | 2 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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Appendix A1: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | ROD % | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 4 |  | 1 | 1251+00 | CL | 828.8 | 0.0-0.6 | clay loam | A-4(8) | -- | -- | 3 | 23 | 47 | 27 | 26 | 20 | 6 |
|  |  | 2 | " | " | " | 0.6-2.5 | clay | A-7-6(15) | -- | -- | 0 | 10 | 39 | 51 | 46 | 21 | 25 |
|  |  | 3 | " | " | " | 4.0-5.0 | clay loam | A-4(0-4) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 4 | " | " | " | 5.0-6.0 | sandy loam | A-2-4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5 |  | 1 | 1256+30 | CL | 827.1 | 0.0-1.8 | clay loam | A-4(5-8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 1.8-3.8 | clay | A-7-6(15) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 3.8-6.0 | " | A-6(6) | -- | -- | 2 | 34 | 33 | 31 | 27 | 16 | 11 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6 |  | 1 | 1263+00 | CL | 826.3 | 0.0-0.8 | clay | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 0.8-3.4 | " | A-7-6(14) | -- | -- | 0 | 13 | 36 | 51 | 45 | 23 | 22 |
|  |  | 3 | " | " | " | 3.4-6.0 | clay loam | A-4(0-4) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7 |  | 1 | 1269+00 | CL | 828.7 | 0.0-1.0 | clay | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 1.0-3.5 | " | A-7-6(8-15) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 3.5-6.0 | clay loam | A-4(0-4) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Appendix A1: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 8 | | 1 | 1274+00 | CL | 826.0 | 0.0-0.7 | clay | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 0.7-3.8 | " | A-7-6(8-15) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 3.8-6.0 | clay loam | A-4(0-4) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 9 | | 1 | 1281+00 | CL | 830.5 | 0.0-0.8 | clay | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 0.8-3.5 | " | A-7-6(8-15) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 3.5-6.0 | " | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 10 | | 1 | 1287+00 | CL | 832.8 | 0.0-0.8 | clay | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 0.8-3.2 | " | A-7-6(8-15) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 3.2-6.0 | " | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 11 | | 1 | 1299+00 | CL | 829.3 | 0.0-0.8 | clay | A-6(8) | -- | -- | 0 | 21 | 42 | 37 | 32 | 21 | 11 |
| | | 2 | " | " | " | 0.8-3.5 | " | A-7-6(13) | -- | -- | 0 | 19 | 31 | 50 | 41 | 19 | 22 |
| | | 3 | " | " | " | 3.5-6.0 | " | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

Apendix A1: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 12 | | 1 | 1305+00 | CL | 832.00 | 0.0-1.2 | clay | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 1.2-3.0 | " | A-7-6(8-15) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 3.0-4.2 | " | A-7-6(14) | -- | -- | 2 | 16 | 39 | 43 | 44 | 20 | 24 |
| | | 4 | " | " | " | 4.2-6.0 | " | A-4(5) | -- | -- | 2 | 37 | 20 | 41 | 29 | 19 | 10 |
| | | | | | | | | | | | | | | | | | |
| 13 | | 1 | 1313+00 | CL | 830.8 | 0.0-1.0 | clay | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 1.0-3.5 | " | A-6(8) | -- | -- | 3 | 30 | 28 | 39 | 31 | 17 | 14 |
| | | 3 | " | " | " | 3.5-6.0 | " | A-6(0-10 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 14 | | 1 | 1319+00 | CL | 827.9 | 0.0-0.8 | clay | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 0.8-2.5 | " | A-7-6(8-15) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 2.5-4.1 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 4 | " | " | " | 4.1-6.0 | clay loam | A-4(3) | -- | -- | 9 | 40 | 28 | 23 | 18 | 12 | 6 |
| | | | | | | | | | | | | | | | | | |
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Appendix A1: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD % | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 15 |  | 1 | 1323+00 | CL | 827.4 | 0.0-1.0 | clay | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 1.0-3.0 | " | A-7-6(8-15) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 3.0-4.2 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 4 | " | " | " | 4.2-6.0 | " | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 16 |  | 1 | 1329+00 | CL | 828.3 | 0.0-0.8 | clay loam | A-6(8) | -- | -- | 0 | 21 | 49 | 30 | 34 | 23 | 11 |
|  |  | 2 | " | " | " | 0.8-2.2 | clay | A-7-6(8-15) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 2.2-4.2 | " | A-6(9) | -- | -- | 0 | 27 | 32 | 41 | 31 | 17 | 14 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 17 |  | 1 | 1335+00 | CL | 828.3 | 0.0-1.0 | clay loam | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 1.0-2.6 | clay | A-7-6(8-15) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 2.6-3.8 | " | A-6(0-10 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 4 | " | " | " | 3.8-6.0 | clay loam | A-4(0-4) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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Appendix A1: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 18 | . | 1 | 1339+50 | CL | 826.5 | 0.0-0.8 | clay loam | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 0.8-2.6 | clay | A-7-6(8-15) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 2.6-4.4 | clay loam | A-6(5) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 4 | " | " | " | 4.4-6.0 | sandy loam | A-4(3) | -- | -- | 2 | 50 | 33 | 15 | NP | NP | NP |
| | | | | | | | | | | | | | | | | | |
| 19 | | 1 | 1352+00 | CL | 831.4 | 0.0-1.0 | silty clay loam | A-4(8) | -- | -- | 0 | 14 | 58 | 28 | 23 | 20 | 3 |
| | | 2 | " | " | " | 1.0-2.4 | clay | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 2.4-4.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 4 | " | " | " | 4.0-6.0 | clay loam | A-4(0-4) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 20 | | 1 | 1359+00 | CL | 824.8 | 0.0-0.8 | clay loam | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 0.8-3.5 | clay | A-7-6(15) | -- | -- | 0 | 12 | 33 | 55 | 47 | 23 | 24 |
| | | 3 | " | " | " | 3.5-5.0 | clay loam | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 4 | " | " | " | 5.0-6.0 | " | A-4(0-4) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
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Appendix A1: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD % | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 21 |  | 1 | 1367+00 | CL | 826.4 | 0.0-0.8 | clay loam | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 0.8-2.6 | clay | A-7-6(8-15) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 2.6-4.5 | " | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 4 | " | " | " | 4.5-7.0 | clay loam | A-4(0-4) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 22 |  | 1 | 1374+00 | CL | 825.2 | 0.0-0.6 | silty clay loam | A-4(5-8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 0.6-1.8 | clay | A-7-6(8-15) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 1.8-3.8 | " | A-6(0-10) | -- | -- | 1 | 17 | 48 | 34 | 37 | 22 | 15 |
|  |  | 4 | " | " | " | 3.8-6.0 | clay loam | A-4(3) | -- | -- | 10 | 39 | 29 | 22 | 23 | 15 | 8 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 23 |  | 1 | 1382+00 | CL | 823.4 | 0.0-0.6 | silty clay loam | A-4(5-8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 0.6-3.8 | clay | A-6(7) | -- | -- | 5 | 37 | 16 | 42 | 33 | 18 | 15 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 24 |  | 1 | 1393+25 | CL | 815.8 | 0.0-0.8 | silty clay loam | A-4(5-8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 0.8-2.5 | clay | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 2.5-4.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 4 | " | " | " | 4.0-6.0 | clay loam | A-4(0-4) | -- | -- | -- | -- | -- | -- | -- | -- | -- |

Appendix A1: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  | % | Gravel | Sand | Silt | Clay |  |  |  |
| 25 |  | 1 | 1400+00 | CL | 817.0 | 0.0-0.3 | silty clay loam | A-4(5-8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 0.3-1.2 | clay loam | A-6(8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 1.2-3.3 | clay | A-6(0-10) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 4 | " | " | " | 3.3-6.0 | clay loam | A-4(0-4) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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Appendix A2: Borehole Data for I-65 East of Franklin

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 26 | | 1 | 660+50 | CL | 747.6 | 1.0-2.0 | loam | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 3.0-4.0 | clay | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 4.0-6.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 27 | | 1 | 666+50 | CL | 740.5 | 1.0-2.0 | loam | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 2.0-3.0 | clay | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 3.0-4.0 | sandy loam | A-4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 4 | " | " | " | 4.0-6.0 | clay | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5 | " | " | " | 6.0-7.0 | clay loam | A-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 28 | | Bag | 678+00 | CL | 741.5 | 0.5-2.0 | clay | A-7-6(15) | -- | -- | -- | 19 | 41 | 40 | 49 | 26 | 23 |
| | | Bag 2 | " | " | " | 3.0-4.0 | clay loam | A-6(12) | -- | -- | -- | 30 | 46 | 24 | 37 | 16 | 21 |
| | | 3 | " | " | " | 4.0-5.0 | sandy loam | A-4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 4 | " | " | " | 5.0-6.0 | clay loam | A-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

Appendix A2: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RCD % | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 29 |  | 1 | 684+00 | 42LT | 741.0 | 1.0-2.0 | loam | A-7-6(11) | -- | -- | -- | 42 | 41 | 17 | 44 | 22 | 22 |
|  |  | 2 | " | " | " | 3.0-4.0 | sandy loam | A-4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 5.0-6.0 | " | " |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 30 |  | 1 | 692+50 | 42LT | 734.5 | 0.0-1.0 | loam | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 1.0-2.5 | clay | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 2.5-6.5 | sandy loam | A-4(0) | -- | -- | -- | 67 | 31 | 2 | NP | NP | NP |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 31 |  | 1 | 701+00 | 42LT | 735.8 | 1.5-2.0 | clay | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 3.0-3.5 | clay loam | A-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 4.0-5.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 4 | " | " | " | 5.0-7.5 | sandy loam | A-4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 32 |  | 1 | " | " | " | 3.0-3.5 | clay loam | A-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 3.5-5.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 6.0-7.0 | sandy loam | A-4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Appendix A2: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 33 | | 1 | 714+00 | 42LT | 737.7 | 1.0-2.0 | clay | A-7-6(16) | -- | -- | -- | 22 | 39 | 39 | 50 | 26 | 24 |
| | | 2 | " | " | " | 5.5-6.0 | clay loam | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 7.0-8.0 | loam | A-4(5) | -- | -- | -- | 39 | 50 | 11 | 19 | 12 | 7 |
| | | 4 | " | " | " | 9.0-10.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5 | " | " | " | 11.0-12.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 34 | | 1 | 718+25 | 55LT | 743.0 | 5.0-7.0 | loam | A-4 | -- | -- | -- | -- | -- | -- | 17 | 14 | 3 |
| | | | | | | | | | | | | | | | | | |
| 35 | | 1 | 717+20 | CL | 739.1 | 0.0-1.5 | loam | A-4 | 13 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 2.5-4.0 | " | " | 8 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 5.0-6.5 | " | " | 11 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 4 | " | " | " | 7.0-8.5 | " | " | 21 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5 | " | " | " | 9.0-10.5 | " | " | 27 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | – | | | | | | | | | | | | | | | |
| 36 | | 1 | 717+25 | CL | 739.2 | 4.0-6.0 | loam | A-4 | -- | -- | -- | -- | -- | -- | 18 | 12 | 6 |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

Appendix A2: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 37 | | 1 | 722+50 | 42LT | 740.3 | 1.0-2.0 | clay loam | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 5.0-6.0 | loam | A-4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 9.0-10.0 | " | " | -- | -- | -- | 47 | 39 | 14 | 20 | 12 | 8 |
| | | 4 | " | " | " | 13.0-14.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 38 | | 1 | 730+50 | 42LT | 740.6 | 0.5-2.0 | clay loam | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 2.0-3.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 39 | | 1 | 740+50 | 42RT | 739.0 | 0.5-1.5 | clay | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 1.5-2.5 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 5.0-6.0 | loam | A-4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 40 | | 1 | 747+00 | 42RT | 743.5 | 1.0-2.0 | loam | A-4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 3.0-4.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 5.0-6.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 41 | | Bag | 750+00 | 42RT | 745.2 | 1.0-3.0 | clay loam | A-7-6(19) | -- | -- | -- | 17 | 61 | 22 | 56 | 27 | 29 |

Appendix A2: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD % | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 42 |  | 1 | 759+00 | 42LT | 741.6 | 1.0-2.0 | silty clay loam | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 5.0-6.0 | loam | A-4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 43 |  | 1 | 765+20 | 42RT | 744.6 | 1.0-2.0 | silty clay | A-7-5 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 5.0-6.0 | loam | A-4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 10.5-11.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 44 |  | 1 | 770+25 | 42RT | 748.6 | 1.0-2.0 | clay | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 4.0-5.0 | silty clay | A-7-5 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 6.0-7.0 | loam | A-4(5) | -- | -- | -- | 45 | 41 | 14 | 20 | 12 | 8 |
|  |  | 4 | " | " | " | 9.0-10.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 45 |  | 1 | 784+15 | 42RT | 751.7 | 0.0-2.0 | clay | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 3.0-4.0 | silty clay | A-7-5 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 4.0-6.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Appendix A2: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 46 | | 1 | 792+00 | 42LT | 756.9 | 1.0-2.0 | clay loam | A-6(6) | -- | -- | -- | 40 | 36 | 24 | 33 | 20 | 13 |
| | | Bag | " | " | " | 2.0-4.0 | silty clay | A-7-5(11) | -- | -- | -- | 9 | 52 | 39 | 46 | 30 | 16 |
| | | 3 | " | " | " | 4.0-6.0 | loam | A-4(4) | -- | -- | -- | 45 | 37 | 18 | 26 | 20 | 6 |
| | | | | | | | | | | | | | | | | | |
| 47 | | 1 | 801+00 | 42RT | 753.0 | 1.0-2.0 | clay | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 3.5-4.0 | loam | A-4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 5.0-6.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 48 | | -- | 808+00 | 42RT | 752.9 | 0.0-0.4 | topsoil | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | -- | " | " | " | 0.4-3.5 | clay | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | -- | " | " | " | 3.5-6.0 | loam | A-4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 49 | | 1 | 814+55 | 42LT | 745.0 | 1.0-1.5 | clay | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 3.5-4.5 | loam | A-4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 5.0-5.5 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 4 | " | " | " | 6.0-6.5 | clay loam | A-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |

Appendix A2: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 50 | | 1 | 816+85 | 42RT | 759.4 | 1.0-2.0 | clay | A-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 2.5-3.0 | sandy loam | A-4(3) | -- | -- | -- | 50 | 38 | 12 | 19 | 13 | 6 |
| | | 3 | " | " | " | 6.0-7.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 51 | | 1 | 822+00 | 42LT | 741.4 | 0.5-1.5 | silty clay | A-7-6(13) | -- | -- | -- | 5 | 54 | 41 | 47 | 28 | 19 |
| | | 2 | " | " | " | 2.5-3.5 | sand | A-2-4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 52 | | 1 | 829+50 | 42RT | 745.9 | 1.0-2.0 | sandy loam | A-4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 3.0-4.0 | clay | A-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 53 | | 1 | 834+85 | 30LT | 768.5 | 1.0-2.0 | sandy loam | A-4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 3.0-4.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 11.0-12.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 4 | " | " | " | 13.0-14.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5 | " | " | " | 17.0-18.0 | loam | A-4(4) | -- | -- | -- | 48 | 50 | 2 | 18 | 12 | 6 |
| | | 6 | " | " | " | 19.0-20.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |

Appendix A2: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD % | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 54 |  | 1 | 844+00 | 42RT | 767.6 | 1.0-2.0 | clay | A-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 3.0-4.0 | sandy loam | A-4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 55 |  | Bag | 852+60 | 42RT | 804.0 | 1.5-3.0 | clay | A-6 | -- | -- | -- | 34 | 35 | 31 | 38 | 16 | 22 |
|  |  | 1 | " | " | " | 9.0-10.0 | silty clay | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 56 |  | 1 | 856+40 | 42RT | 784.1 | 3.0-4.0 | silty clay | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 5.0-6.0 | sandy loam | A-4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 57 |  | 1 | 862+0 | CL | 788.1 | 1.0-2.0 | silty clay | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 4.5-5.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 6.0-7.0 | silty loam | A-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 58 |  | -- | 870+00 | 42RT | 792.6 | 0.0-0.8 | topsoil | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | -- | " | " | " | 0.8-7.5 | silty clay | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Appendix A2: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD % | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 59 |  | -- | 877+00 | CL | 790.7 | 0.0-3.5 | silty clay loam | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | -- | " | " | " | 3.5-6.0 | silty clay | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 60 |  | -- | 884+50 | 42RT | 788.2 | 0.0-2.5 | silty clay loam | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | -- | " | " | " | 2.5-6.0 | silty clay | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 61 |  | 1 | 891+00 | 42LT | 792.5 | 2.0-4.0 | silty clay loam | A-7-6(13) | -- | -- | -- | 20 | 53 | 27 | 43 | 21 | 22 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 62 |  | 1 | 906+25 | 42RT | 798.8 | 0.0-1.0 | silty clay loam | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 2.0-4.0 | silty clay | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 63 |  | Bag | 975+00 | 42LT | 810.0 | 1.5-3.0 | clay | A-7-6(12) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 5.0-6.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 7.0-8.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 64 |  | 1 | 979+40 | 42RT | 801.0 | 1.0-2.0 | silty clay loam | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 5.0-6.0 | silty clay | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |

Appendix A2: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| | | 1 | 979+40 | 42RT | 801.0 | 1.0-2.0 | silty clay loam | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 5.0-6.0 | silty clay | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 65 | | 1 | 984+00 | 42RT | 802.0 | 1.0-2.0 | silty clay | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 5.0-6.0 | " | A-7-6(20) | -- | -- | -- | 1 | 53 | 46 | 64 | 23 | 41 |
| | | | | | | | | | | | | | | | | | |
| 66 | | 1 | 990+50 | 42LT | 803.2 | 1.0-2.0 | silty clay loam | A-7-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 4.0-5.0 | clay loam | A-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 67 | | DS-1 | 718+21.77 | 60LT | 739.92 | 2.5-4.0 | sandy loam | -- | 15 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-2 | " | " | " | 5.0-6.5 | silty clay loam | -- | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-3 | " | " | " | 8.5-10.0 | sandy loam | -- | 32 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-4 | " | " | " | 13.5-15.0 | " | -- | 85 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-5 | " | " | " | 18.5-20.0 | " | -- | <100 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-6 | " | " | " | 23.5-25.0 | " | -- | 24 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-7 | " | " | " | 28.5-30.0 | " | -- | 31 | -- | -- | -- | -- | -- | -- | -- | -- |
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Appendix A2: Continued.

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 68 | | DS-1 | 718+93.59 | 27LT | 740.09 | 2.5-4.0 | clay loam | -- | 15 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-2 | " | " | " | 5.0-6.5 | " | -- | 14 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-3 | " | " | " | 8.5-10.0 | sandy clay | -- | 12 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-4 | " | " | " | 13.5-15.0 | sand & grav. | -- | 33 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-5 | " | " | " | 18.5-20.0 | silty loam | -- | >100 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-6 | " | " | " | 23.5-25.0 | " | -- | 28 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-7 | " | " | " | 28.5-30.0 | " | -- | 39 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
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Appendix A2: Continued.

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 69 | | DS-1 | 718+58.21 | 27RT | 740.03 | 2.5-4.0 | silty loam | -- | 27 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-2 | " | " | " | 5.0-6.5 | " | -- | 10 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-3 | " | " | " | 8.5-10.0 | sandy loam | -- | 40 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-4 | " | " | " | 13.5-15.0 | silty loam | -- | 68 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-5 | " | " | " | 18.5-20.0 | " | -- | 80 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-6 | " | " | " | 23.5-25.0 | " | -- | 72 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-7 | " | " | " | 28.5-30.0 | " | -- | 64 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-8 | " | " | " | 33.5-35.0 | silty clay loam | -- | 49 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-9 | " | " | " | 38.5-40.0 | " | -- | 31 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-10 | " | " | " | 43.5-45.0 | sandy loam | -- | 70 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | DS-11 | " | " | " | 48.5-50.0 | " | -- | 73 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
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Appendix A2: Continued.

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD % | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 70 |  | DS-1 | 719+30 | 60RT | 739.51 | 2.5-4.0 | silty loam | -- | 15 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-2 | " | " | " | 5.0-6.5 | sandy loam | -- | 10 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-3 | " | " | " | 8.5-10.0 | sandy clay loam | -- | 21 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-4 | " | " | " | 13.5-15.0 | sandy loam | -- | 87 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-5 | " | " | " | 18.5-20.0 | " | -- | 82 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-6 | " | " | " | 23.5-25.0 | " | -- | 64 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-7 | " | " | " | 28.5-30.0 | " | -- | 32 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 71 |  | DS-1 | 823.20.69 | 60LT | 741.72 | 1.0-2.5 | silty clay loam | -- | 8 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-2 | " | " | " | 3.5-5.0 | " | -- | 16 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-3 | " | " | " | 8.5-10.0 | sand & grav | -- | 6 | -- | -- | -- | -- | -- | -- | -- |  |
|  |  | DS-4 | " | " | " | 13.5-15.0 | " | -- | 25 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-5 | " | " | " | 18.5-20.0 | " | -- | 30 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-6 | " | " | " | 23.5-25.0 | " | -- | 21 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-7 | " | " | " | 28.5-30.0 | sandy clay | -- | 29 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-8 | " | " | " | 33.5-35.0 | " | -- | 38 | -- | -- | -- | -- | -- | -- | -- | -- |
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Appendix A2: Continued.

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD % | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 72 |  | DS-1 | 823+97.39 | 27LT | 741.63 | 1.0-2.5 | silty loam | -- | 7 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-2 | " | " | " | 3.5-5.0 | sand | -- | 12 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-3 | " | " | " | 8.5-10.0 | " | -- | 7 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-4 | " | " | " | 13.5-15.0 | sand & grav | -- | 21 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-5 | " | " | " | 18.5-20.0 | " | -- | 30 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-6 | " | " | " | 23.5-25.0 | " | -- | 38 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-7 | " | " | " | 28.5-30.0 | sandy clay loam | -- | 26 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-8 | " | " | " | 33.5-35.0 | " | -- | 38 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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Appendix A2: Continued.

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD % | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 73 |  | DS-1 | 823+93.66 | 27RT | 741.49 | 2.5-4.0 | silty clay loam | -- | 7 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-2 | " | " | " | 5.0-6.5 | sand | -- | 12 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-3 | " | " | " | 8.5-10.0 | sand & grav | -- | 9 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-4 | " | " | " | 13.5-15.0 | " | -- | 18 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-5 | " | " | " | 18.5-20.0 | " | -- | 16 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-6 | " | " | " | 23.5-25.0 | " | -- | 26 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-7 | " | " | " | 28.5-30.0 | silty loam | -- | 30 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-8 | " | " | " | 33.5-35.0 | sand & grav | -- | 58 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-9 | " | " | " | 40.0-41.5 | silty loam | -- | 53 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-10 | " | " | " | 43.5-45.0 | sandy loam | -- | 41 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-11 | " | " | " | 48.5-50.0 | sandy silt | -- | 50 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-12 | " | " | " | 53.5-55.0 | " | -- | 44 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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Appendix A2: Continued.

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD % | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 74 |  | DS-1 | 824+70.35 | 60RT | 741.88 | 1.0-2.5 | silty loam | -- | 7 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-2 | " | " | " | 3.5-5.0 | sand & grav. | -- | 15 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-3 | " | " | " | 8.5-10.0 | " | -- | 8 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-4 | " | " | " | 13.5-15.0 | " | -- | 20 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-5 | " | " | " | 18.5-20.0 | " | -- | 17 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-6 | " | " | " | 23.5-25.0 | " | -- | 19 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-7 | " | " | " | 28.5-30.0 | " | -- | 25 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | DS-8 | " | " | " | 33.5-35.0 | " | -- | 34 | -- | -- | -- | -- | -- | -- | -- | -- |
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Appendix A3: Borehole Data for S.R. 44, 2.1 miles West of S.R. 135

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 75 | | SS-1 | 95+65 | 40RT | 805.8 | 1.0-2.5 | silty loam to silty clay loam | --- | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-2 | " | " | " | 3.5-5.0 | sandy loam | --- | 50 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-3 | " | " | " | 6.0-7.5 | loam | A-4(4) | 45 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-4 | " | " | " | 8.5-9.5 | " | " | <100 | -- | 4 | 30 | 46 | 20 | 25 | 15 | 10 |
| | | | | | | | | | | | | | | | | | |
| 76 | | SS-1 | 98+50 | 40LT | 806.3 | 1.0-2.5 | loam | A-4 | 6 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-2 | " | " | " | 3.5-5.0 | silty clay loam | A-6(12) | 5 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-3 | " | " | " | 6.0-7.5 | " | " | 6 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-4 | " | " | " | 8.5-10.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | Bag | " | " | " | 3.0-7.0 | " | " | -- | -- | 7 | 34 | 42 | 18 | 20 | 13 | 7 |
| | | | | | | | | | | | | | | | | | |
| 77 | | SS-1 | 102+70 | 20LT | 802.6 | 1.0-2.5 | loam | A-4 | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-2 | " | " | " | 4.0-5.0 | clay | A-7-6(15) | 12 | -- | 2 | 24 | 40 | 35 | 42 | 20 | 22 |
| | | SS-3 | " | " | " | 6.0-7.5 | loam | A-4(2) | 17 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 78 | | PT-1 | 102+67 | 20LT | 803.6 | 0.0-0.2 | loam | A-4 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | PT-2 | " | " | " | 2.0-2.2 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |

Appendix A3: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  | % | Gravel | Sand | Silt | Clay |  |  |  |
| 79 |  | SS-1 | 105+50 | 45RT | 776.0 | 1.0-2.5 | silty loam | --- | 2 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-2 | " | " | " | 3.5-5.0 | sandy loam | --- | 55 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-3 | " | " | " | 6.0-7.5 | loam | A-4(3) | 51 | -- | 0 | 2 | 74 | 24 | 26 | 17 | 9 |
|  |  | SS-4 | " | " | " | 7.5-9.0 | loam w/rock frag. | A-4(1) | 42 | -- | 9 | 30 | 42 | 19 | 23 | 15 | 8 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 80 |  | SS-1 | 106+50 | 50LT | 787.3 | 1.0-2.5 | sand & gravel | --- | 9 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-2 | " | " | " | 3.5-5.0 | loam | A-4 | 9 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-3 | " | " | " | 6.0-7.5 | silty clay loam | " | 5 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-4 | " | " | " | 8.5-10.0 | " | " | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-5 | " | " | " | 13.5-15.0 | " | " | 16 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-6 | " | " | " | 18.5-20.0 | " | " | 32 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-7 | " | " | " | 23.5-25.0 | " | " | 18 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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Appendix A3: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 81 | . | SS-1 | 110+00 | 25RT | 809.9 | 1.0-2.5 | silty clay loam | A-4 | 6 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-2 | " | " | " | 3.5-5.0 | " | " | 9 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-3 | " | " | " | 6.0-7.5 | " | " | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-4 | " | " | " | 8.5-10.0 | " | " | 20 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-5 | " | " | " | 13.5-15.0 | loam | " | 27 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 82 | | SS-1 | 113+00 | CL | 808.8 | 1.0-2.5 | silty clay loam | A-4 | 6 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-2 | " | " | " | 3.5-5.0 | " | " | 8 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-3 | " | " | " | 6.0-7.5 | " | " | 15 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-4 | " | " | " | 8.5-10.0 | loam | " | 42 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 83 | | SS-1 | 120+00 | CL | 831.5 | 1.0-2.5 | silty clay loam | A-4 | 6 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-2 | " | " | " | 3.5-5.0 | " | " | 11 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-3 | " | " | " | 6.0-7.5 | loam | " | 17 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-4 | " | " | " | 8.5-10.0 | " | " | 34 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-5 | " | " | " | 13.5-15.0 | loam to silty clay loam | " | 13 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-6 | " | " | " | 8.5-20.0 | silty clay loam | " | 11 | -- | -- | -- | -- | -- | -- | -- | -- |

Appendix A3: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD % | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 84 |  | SS-1 | 126+100 | CL | 806.8 | 1.0-2.5 | loam | A-4 | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-2 | " | " | " | 3.5-5.0 | " | " | 5 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-3 | " | " | " | 6.0-7.5 | " | " | 23 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-4 | " | " | " | 8.5-10.0 | silty clay loam | " | 73 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 85 |  | SS-1 | 131+06 | 10LT | 820.3 | 1.0-2.5 | fill | --- | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-2 | " | " | " | 3.5-5.0 | silty clay loam | A-4 | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-3 | " | " | " | 6.0-7.5 | " | " | 6 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-4 | " | " | " | 8.5-10.0 | silt | A-6(5) | 5 | -- | 7 | 31 | 48 | 14 | 25 | 15 | 10 |
|  |  | SS-5 | " | " | " | 13.5-15.0 | silty clay loam (fill) | A-4 | 21 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-6 | " | " | " | 18.5-20.0 | loam | " | 21 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 86 |  | SS-1 | 135+00 | 12RT | 835.8 | 1.0-2.5 | silty clay loam | A-4 | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-2 | " | " | " | 3.5-5.0 | " | " | 5 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-3 | " | " | " | 6.0-7.5 | " | " | 3 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-4 | " | " | " | 8.5-10.0 | silty clay | A-4(8) | 3 | -- | 0 | 13 | 60 | 27 | 35 | 21 | 14 |
|  |  | SS-5 | " | " | " | 13.5-15.0 | loam | A-4 | 12 | -- | -- | -- | -- | -- | -- | -- | -- |

Appendix A4: Borehole Data for S.R. 44 from W. of Youngs Creek NE to S.R. 144 W. of Franklin.

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD % | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 87 |  | -- | 98+00 | CL | 755.0 | 0.0-1.0 | topsoil | A-4(8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | -- | " | " | " | 1.0-3.2 | -- | A-7-6(7) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 88 |  | -- | 100+50 | CL | 754.0 | 0.0-0.9 | clay loam | A-4(8) | -- | -- | 1 | 26 | 48 | 18 | 30 | 21 | 9 |
|  |  | -- | " | " | " | 0.9-2.8 | clay | A-7-6(17) | -- | -- | 1 | 15 | 45 | 18 | 49 | 21 | 28 |
|  |  | -- | " | " | " | 2.8-5.0 | loam or<br>sandy loam | A-6(8) | -- | -- | 3 | 47 | 32 | 11 | 30 | 16 | 14 |
|  |  | -- | " | " | " | 5.0-5.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 89 |  | -- | 104+00 | CL | 748.4 | 0.0-0.8 | topsoil | A-4(8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | -- | " | " | " | 0.8-3.5 | -- | A-7-6(17) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | -- | " | " | " | 3.5-4.2 | -- | A-6(6) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 90 |  | -- | 109+00 | CL | 729.3 | 0.0-1.3 | topsoil | A-4(8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | -- |  | " | " | 1.3-8.0 | clay | A-7-6(14) | -- | -- | 0 | 19 | 49 | 21 | 42 | 19 | 23 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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Appendix A4: Continued.

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD % | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 91 |  | -- | 112+50 | CL | 729.0 | 0.0-1.4 | topsoil | A-4(8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | -- | " | " | " | 1.4-3.2 | -- | A-6(6) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | -- | " | " | " | 3.2-4.2 | sandy loam | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 92 |  | -- | 115+00 | CL | 729.4 | 0.0-1.4 | topsoil | A-4(8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | -- | " | " | " | 1.4-4.5 | sandy loam | A-4(3) | -- | -- | 1 | 52 | 33 | 12 | 26 | 17 | 9 |
|  |  | -- | " | " | " | 4.5-6.0 | sand | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 93 |  | -- | 116+80 | CL | 753.7 | 0.0-0.8 | topsoil | A-4(8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | -- | " | " | " | 0.8-3.0 | -- | A-7-6(17) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | -- | " | " | " | 3.0-18.0 | -- | A-6(6) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 94 |  | -- | 124+00 | CL | 753.0 | 0.0-1.0 | topsoil | A-4(8) | -- | -- | -- | -- | -- | -- | -- |  | -- |
|  |  | -- | " | " | " | 1.0-2.5 | -- | A-7-6(7) | -- | -- | -- | -- | -- | -- | -- |  | -- |
|  |  | -- | " | " | " | 2.5-4.2 | -- | A-6(6) | -- | -- | -- | -- | -- | -- | -- |  | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Appendix A4: Continued.

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 95 | | -- | 128+00 | CL | 752.3 | 0.0-0.8 | topsoil | A-4(8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | -- | " | " | " | 0.8-2.0 | -- | A-7-6(17) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | -- | " | " | " | 2.0-4.5 | -- | A-6(6) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 96 | | -- | 130+75 | CL | 749.8 | 0.0-0.9 | topsoil | A-4(8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | -- | " | " | " | 0.9-4.0 | -- | A-7-6(13) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | -- | " | " | " | 4.0-4.8 | -- | A-6(6) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 97 | | -- | 137+00 | CL | 752.4 | 0.0-1.0 | topsoil | A-4(8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | -- | " | " | " | 1.0-4.2 | clay loam | A-7-6(13) | -- | -- | 3 | 25 | 43 | 20 | 41 | 19 | 22 |
| | | | | | | | | | | | | | | | | | |
| 98 | | -- | 140+50 | CL | 757.4 | 0.0-0.9 | topsoil | A-4(8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | -- | " | " | " | 0.9-2.8 | -- | A-7-6(17) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 99 | | -- | 145+00 | CL | 754.7 | 0.0-1.2 | topsoil | A-4(8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | -- | " | " | " | 1.2-6.0 | -- | A-7-6(13) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |

Appendix A4: Continued.

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD % | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 100 | . | -- | 149+00 | CL | 756.5 | 0.0-0.9 | topsoil | A-4(8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | -- | " | " | " | 0.9-1.8 | -- | A-7-6(13) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | -- | " | " | " | 1.8-4.5 | -- | A-6(6) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 101 |  | -- | 155+00 | CL | 748.4 | 0.0-0.8 | topsoil | A-4(8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | -- | " | " | " | 0.8-3.0 | -- | A-7-6(13) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 102 |  | -- | 159+20 | CL | 747.6 | 0.0-0.8 | topsoil | A-4(8) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | -- | " | " | " | 0.8-3.0 | -- | A-7-6(13) | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Appendix A5: Borehole Data for S.R. 44 over South Prong of Stotts Creek

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 103 | | 1SS | 137+15 | 6RT | 768.3 | 1.0-2.5 | silty loam | A-6(10) | 7 | -- | 1 | 7 | 74 | 18 | 32 | 20 | 12 |
| | | 2SS | " | " | " | 3.5-5.0 | " | " | 5 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3SS | " | " | " | 6.0-7.0 | silty loam to siltstone | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 1RC | " | " | " | 8.0-13.0 | siltstone | -- | -- | 27 | -- | -- | -- | -- | -- | -- | -- |
| | | 2RC | " | " | " | 13.0-18.0 | " | -- | -- | 77 | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 104 | | 1SS | 137+41 | 6RT | 766.1 | 1.0-2.5 | silty loam | A-6 | 6 | -- | 23 | 44 | 29 | 4 | NP | NP | NP |
| | | 2SS | " | " | " | 3.5-5.0 | sandy loam w/gravel | A-2-4(0) | 38 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 1RC | " | " | " | 6.0-11.0 | siltstone | -- | -- | 0 | -- | -- | -- | -- | -- | -- | -- |
| | | 2RC | " | " | " | 11.0-16.0 | " | -- | -- | 55 | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 105 | | 1SS | 137+86 | 28RT | 775.0 | 1.0-2.5 | fill | A-6 | 29 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2SS | " | " | " | 3.5-5.0 | sandy loam w/gravel | A-2-4 | 10 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3SS | " | " | " | 6.0-7.5 | " | " | 13 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 4SS | " | " | " | 8.5-10.0 | silty loam | A-4(6) | 8 | -- | 0 | 30 | 57 | 13 | 33 | 23 | 10 |
| | | 1RC | " | " | " | 13.0-18.0 | siltstone | -- | -- | 0 | -- | -- | -- | -- | -- | -- | -- |
| | | 2RC | " | " | " | 18.0-23.0 | " | -- | -- | 63 | -- | -- | -- | -- | -- | -- | -- |

Appendix A5: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD % | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 106 |  | 1SS | 138+23 | 9LT | 769.5 | 1.0-2.5 | loam | A-6(4) | 8 | -- | 4 | 40 | 41 | 15 | 29 | 15 | 14 |
|  |  | 2SS | " | " | " | 3.5-5.0 | " | " | 5 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3SS | " | " | " | 6.0-6.5 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 1RC | " | " | " | 8.0-13.0 | siltstone | -- | -- | 0 | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2RC | " | " | " | 13.0-18.0 | " | -- | -- | 48 | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 107 |  | 1SS | 131+40 | 24RT | 797.6 | 1.0-2.5 | loam | A-6 | 7 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2SS | " | " | " | 3.5-5.0 | " | " | 22 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3SS | " | " | " | 6.0-7.5 | sandy clay loam | A-6(4) | 36 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 4SS | " | " | " | 8.5-10.0 | " | " | 35 | -- | 9 | 44 | 25 | 22 | 33 | 17 | 16 |
|  |  | 5SS | " | " | " | 11.0-12.5 | siltstone | -- | 53 | -- | -- | -- | -- | -- | -- | -- | -- |

Appendix 5: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD % | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 108 |  | 1SS | 132+40 | 31RT | 801.0 | 1.0-2.5 | loam | A-6 | 6 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2SS | " | " | " | 3.5-5.0 | " | " | 10 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3SS | " | " | " | 6.0-7.5 | " | " | 9 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 4SS | " | " | " | 8.5-10.0 | sandy clay loam | " | 26 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 5SS | " | " | " | 11.0-12.5 | " | " | 32 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 6SS | " | " | " | 13.5-15.0 | " | " | 49 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 7SS | " | " | " | 16.0-17.0 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 8SS | " | " | " | 18.5-18.8 | siltstone | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 9SS | " | " | " | 21.0-21.5 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 10SS | " | " | " | 23.5-23.7 | " | " | -- | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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Appendix A5: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 109 | | 1SS | 133+25 | 55RT | 799.9 | 1.0-2.5 | loam | A-6 | 39 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2SS | " | " | " | 3.5-5.0 | " | " | 35 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3SS | " | " | " | 6.0-7.5 | sandy clay loam | " | 76 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 4SS | " | " | " | 8.5-10.0 | " | " | 38 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5SS | " | " | " | 11.0-12.5 | " | " | 33 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 6SS | " | " | " | 13.5-15.0 | " | " | 59 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7SS | " | " | " | 16.0-17.5 | " | " | 53 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 8SS | " | " | " | 18.5-20.0 | " | " | 40 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 9SS | " | " | " | 21.0-22.5 | siltstone | -- | 40 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10SS | " | " | " | 23.5-25.0 | " | -- | 71 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 110 | | 1AU | 133+25 | 40RT | 808.5 | 1.0-6.5 | loam | A-6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 111 | | 1SS | 140+00 | 30LT | 772.3 | 1.0-2.5 | loam | A-6 | 8 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2SS | " | " | " | 3.5-5.0 | " | " | 12 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3SS | " | " | " | 6.0-7.5 | " | " | 5 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 4SS | " | " | " | 8.5-10.0 | loam to siltstone | -- | 35 | -- | -- | -- | -- | -- | -- | -- | -- |

Appendix A5: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 112 | | 1Bag | 132+36 | 28-30 | 800.8 | 1.0-4.0 | sandy loam | A-4(0) | -- | -- | 11 | 41 | 37 | 11 | 22 | 15 | 1 |
| | | | -38 | RT | | | | | | | | | | | | | |
| | | 1 Bag | " | " | " | 4.0-5.0 | loam | A-6(5) | -- | -- | 6 | 37 | 43 | 15 | 28 | 15 | 13 |
| | | 2 Bag | " | " | " | 11.0-13.5 | silty loam | A-6(8) | -- | -- | 6 | 20 | 55 | 20 | 30 | 15 | 15 |
| | | | | | | | | | | | | | | | | | |
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Appendix A6: Borehole data for S.R. 44 over Moores Creek

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 113 | | SS-1 | 179+65 | 22LT | 760.4 | 1.0-2.5 | sandy loam | A-4(0) | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-2 | " | " | " | 3.5-5.0 | " | " | 4 | -- | 0 | 55 | 33 | 12 | 25 | 20 | 5 |
| | | SS-3 | " | " | " | 6.0-7.5 | " | " | 2 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-4 | " | " | " | 8.5-10.0 | clay loam | A-6(8) | 5 | -- | 2 | 32 | 45 | 21 | 34 | 19 | 15 |
| | | SS-5 | " | " | " | 13.5-15.0 | sand | -- | 10 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-6 | " | " | " | 18.5-20.0 | " | -- | 17 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-7 | " | " | " | 23.5-25.0 | " | -- | 13 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-8 | " | " | " | 28.5-30.0 | " | -- | 23 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-9 | " | " | " | 33.5-35.0 | " | -- | 50 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-10 | " | " | " | 38.5-40.0 | shale | -- | 40 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-11 | " | " | " | 43.5-45.0 | " | -- | >100 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-12 | " | " | " | 48.5-50.0 | " | -- | >100 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
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Appendix A6: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | ROD % | Grain Size Distri bution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 114 |  | SS-1 | 179+92 | 25.5RT | 762.9 | 1.0-2.5 | clay loam | A-6(10) | 4 | -- | 8 | 31 | 36 | 25 | 37 | 17 | 20 |
|  |  | SS-2 | " | " | " | 3.5-5.0 | " | " | 13 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-3 | " | " | " | 6.0-7.5 | sandy loam | A-4 | 7 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-4 | " | " | " | 8.5-10.0 | sand | -- | 11 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-5 | " | " | " | 13.5-15.0 | " | -- | 6 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-6 | " | " | " | 18.5-20.0 | sandy gravel | A-1-9(0) | 15 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-7 | " | " | " | 23.5-25.0 | " | " | 15 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-8 | " | " | " | 28.5-30.0 | " | " | 25 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-9 | " | " | " | 33.5-35.0 | " | " | 18 | -- | 60 | 36 | ←4 | → | NP | NP | NP |
|  |  | SS-10 | " | " | " | 38.5-40.0 | " | " | 62 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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Appendix A6: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD % | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 115 |  | SS-1 | 180+09 | 22LT | 761.1 | 1.0-2.5 | sandy loam | A-4 | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-2 | " | " | " | 3.5-5.0 | " | " | 3 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-3 | " | " | " | 6.0-7.5 | sand | -- | 3 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-4 | " | " | " | 8.5-10.0 | " | -- | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-5 | " | " | " | 13.5-15.0 | " | -- | 7 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-6 | " | " | " | 18.5-20.0 | " | -- | 16 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-7 | " | " | " | 23.5-25.0 | loam | A-4 | 7 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-8 | " | " | " | 28.5-30.0 | sandy loam to shale | -- | 15 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-9 | " | " | " | 33.5-35.0 | shale | -- | 41 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-10 | " | " | " | 38.5-38.8 | " | -- | >100 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-11 | " | " | " | 43.5-43.9 | " | -- | >100 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | SS-12 | " | " | " | 48.5-48.6 | " | -- | >100 | -- | -- | -- | -- | -- | -- | -- | -- |
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Appendix A6: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 116 | | SS-1 | 180+23 | 23.5RT | 763.1 | 1.0-2.5 | clay loam | A-7-6(16) | 6 | -- | -- | -- | -- | -- | 47 | 18 | 29 |
| | | SS-2 | " | " | " | 3.5-5.0 | " | " | 9 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-3 | " | " | " | 6.0-7.5 | sandy loam | A-4 | 9 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-4 | " | " | " | 8.5-10.0 | " | " | 3 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-5 | " | " | " | 13.5-15.0 | clay loam | A-6 | 17 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-6 | " | " | " | 18.5-20.0 | sand | -- | 24 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-7 | " | " | " | 23.5-25.0 | " | -- | 17 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-8 | " | " | " | 28.5-30.0 | " | -- | 22 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-10 | " | " | " | 33.5-35.0 | " | -- | 19 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | BS-1 | " | " | " | 1.0-3.0 | clay loam | A-7-6(16) | -- | -- | 4 | 32 | 37 | 27 | 48 | 18 | 29 |
| | | | | | | | | | | | | | | | | | |
| 117 | | SS-1 | 172+00 | 38LT | 760.3 | 1.0-2.5 | clay loam | A-7-6 | 6 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-2 | " | " | " | 3.5-5.0 | " | " | 5 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-3 | " | " | " | 6.0-7.5 | loam | A-4 | 40 | -- | -- | -- | -- | -- | -- | -- | -- |
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Appendix A6: continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 118 | | SS-1 | 184+90 | 40LT | 772.7 | 1.0-2.5 | clay loam | A-7-6 | 9 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-2 | " | " | " | 3.5-5.0 | " | " | 29 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-3 | " | " | " | 6.0-7.5 | loam | A-4(2) | 18 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-4 | " | " | " | 8.5-10.0 | " | " | 24 | -- | 14 | 32 | 37 | 18 | 24 | 14 | 10 |
| | | | | | | | | | | | | | | | | | |
| 119 | | SS-1 | 189+71 | 49LT | 768.0 | 1.0-2.5 | sandy loam | A-4 | 6 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-2 | " | " | " | 3.5-5.0 | sandy gravel | A-1-a | 11 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-3 | " | " | " | 6.0-7.5 | loam | A-4 | 22 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| 120 | | SS-1 | 189+90 | 37RT | 770.5 | 1.0-2.5 | sand | -- | 7 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-2 | " | " | " | 3.5-5.0 | sandy loam | A-4 | 18 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | SS-3 | " | " | " | 6.0-7.5 | loam | " | 26 | -- | -- | -- | -- | -- | -- | -- | -- |
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Appendix A7:

Borehole data for S.R. 252 over the Big Blue River

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 121 | . | 1 | 578+85 | 18 RT | 654.7 | 0.0- 1.5 | Sand | -- | 10 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 2.5- 4.0 | " | -- | 6 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 5.0- 6.5 | " | -- | 6 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 4 | " | " | " | 7.5- 9.0 | Clay loam | -- | 10 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5 | " | " | " | 10.0-11.5 | " | -- | 7 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 6 | " | " | " | 14.0-15.5 | Sandy loam | -- | 14 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7 | " | " | " | 19.0-20.5 | Sand | -- | 11 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 8 | " | " | " | 24.0-25.5 | Silty clay loam | -- | 16 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 9 | " | " | " | 29.0-30.5 | " | -- | 25 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10 | " | " | " | 34.0-34.1 | Shale | -- | > 100 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11 | " | " | " | 34.1-39.1 | " | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
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Appendix A7: Continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 122 | | 1 | 579+61 | 17 LT | 647.2 | 0.0- 1.5 | Sand | -- | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 2.5- 4.0 | " | -- | 7 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 5.0- 6.5 | " | -- | 6 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 4 | " | " | " | 7.5- 9.0 | " | -- | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5 | " | " | " | 10.0-11.5 | " | -- | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 6 | " | " | " | 14.0-15.5 | " | -- | 2 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7 | " | " | " | 19.0-20.5 | " | -- | 1 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 8 | " | " | " | 24.0-25.5 | " | -- | 5 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 9 | " | " | " | 29.0-30.5 | " | -- | 33 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10 | " | " | " | 34.0-34.3 | Shale | -- | >100 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11-RC | " | " | " | 34.5-39.5 | " | -- | >100 | -- | -- | -- | -- | -- | -- | -- | -- |
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Appendix A7: Continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  | % | Gravel | Sand | Silt | Clay |  |  |  |
| 123 |  | 1 | 580+46 | 19RT | 648.9 | 0.0- 1.5 | Sand | -- | 5 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 2.5- 4.0 | " | -- | 1 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 5.0- 6.5 | " | -- | 3 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 4 | " | " | " | 7.5- 9.0 | " | -- | 2 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 5 | " | " | " | 10.0-11.5 | Clay loam | -- | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 6 | " | " | " | 15.0-16.5 | Sandy clay loam | -- | 6 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 7 | " | " | " | 20.0-25.3 | Sand | -- | 5 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 8 | " | " | " | 25.0-25.3 | Shale | -- | >100 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 9 | " | " | " | 25.3-30.3 | " | -- | >100 | -- | -- | -- | -- | -- | -- | -- | -- |
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Appendix A7: Continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description |  | Blow per Ft. | RQD % | Grain Size Distribution |  |  |  | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Texture | AASHTO |  |  | Gravel | Sand | Silt | Clay |  |  |  |
| 124 |  | 1 | 581+32 | 18 LT | 647.7 | 4.5- 6.0 | Sand | -- | 5 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 2 | " | " | " | 7.0- 8.5 | Silty clay loam | -- | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 3 | " | " | " | 9.5-11.0 | Sand | -- | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 4 | " | " | " | 12.0-13.5 | Sandy clay loam | -- | 2 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 5 | " | " | " | 14.5-16.0 | Sandy loam | -- | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 6 | " | " | " | 18.5-20.0 | " | -- | 7 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 7 | " | " | " | 23.5-25.0 | " | -- | 9 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 8 | " | " | " | 28.5-30.0 | " | -- | 8 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 9 | " | " | " | 33.5-35.0 | Sand | -- | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 10 | " | " | " | 38.5-40.0 | " | -- | 8 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 11 | " | " | " | 43.5-43.8 | Shale and limestone | -- | >100 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  | 12-RC | " | " | " | 43.8-48.8 | Shale | -- | >100 | -- | -- | -- | -- | -- | -- | -- | -- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Appendix A7: Continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 125 | . | 1 | 582+17 | 19 RT | 652.7 | 0.0- 1.5 | Silty clay loam | -- | 3 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 2.5- 4.0 | Sand | -- | 9 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 5.0- 6.5 | " | -- | 9 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 4 | " | " | " | 7.5- 9.0 | Sandy clay loam | -- | 13 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5 | " | " | " | 10.0-11.5 | " | -- | 2 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 6 | " | " | " | 15.0-16.5 | " | -- | 5 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7 | " | " | " | 20.0-21.5 | " | -- | 5 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 8 | " | " | " | 25.0-26.5 | Sandy load | -- | 8 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 9 | " | " | " | 30.0-31.5 | Sand | -- | 11 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10 | " | " | " | 35.0-36.5 | " | -- | 5 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11 | " | " | " | 40.0-41.5 | " | -- | 8 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 12 | " | " | " | 45.0-46.5 | " | -- | 8 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 13-RC | " | " | " | 48.4-53.4 | Shale & limestone to shale | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | – | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

Appendix A7: Continued

| Boring No. | Project | Sample No. | Station No. | Offset Ft. | Ground Elevation Ft. | Sample Depth Ft. | Soil Description | | Blow per Ft. | RQD % | Grain Size Distribution | | | | LL | PL | PI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Texture | AASHTO | | | Gravel | Sand | Silt | Clay | | | |
| 126 | . | 1 | 582+95 | 17 LT | 653.5 | 0.0- 1.5 | Silty clay loam | -- | 1 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 2 | " | " | " | 2.5- 4.0 | Sandy load | -- | 3 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 3 | " | " | " | 5.0- 6.5 | Sand | -- | 4 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 4 | " | " | " | 7.5- 9.0 | " | -- | 6 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 5 | " | " | " | 10.0-11.5 | " | -- | 5 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 6 | " | " | " | 15.0-16.5 | " | -- | 3 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 7 | " | " | " | 20.0-21.5 | " | -- | 3 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 8 | " | " | " | 25.0-26.5 | " | -- | 10 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 9 | " | " | " | 30.0-31.5 | " | -- | 24 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 10 | " | " | " | 35.0-36.5 | " | -- | 31 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 11 | " | " | " | 40.0-41.5 | " | -- | 14 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 12 | " | " | " | 45.0-46.5 | ' | -- | 12 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 13 | " | " | " | 50.0-50.3 | Shale | -- | >100 | -- | -- | -- | -- | -- | -- | -- | -- |
| | | 14-RC | " | " | " | 50.3-55.3 | Limestone to shale | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

# APPENDIX B

# PHYSICAL AND CHEMICAL PROPERTIES OF AGRICULTURAL SOILS IN JOHNSON COUNTY (1)

# APPENDIX B. PHYSICAL AND CHEMICAL PROPERTIES OF AGRICULTURAL SOILS IN JOHNSON COUNTY (1)

| Soil series and map symbols | Depth | Permeability | Available water capacity | Soil reaction | Salinity | Shrink-swell potential | Risk of corrosion |  | Erosion factors |  | Wind erodibility group |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  | Uncoated steel | Concrete | K | T |  |
|  | *In* | *In/hr* | *In/in* | *pH* | *Mmhos/cm* |  |  |  |  |  |  |
| Brookston: Br | 0-17 | 0.6-2.0 | 0.21-0.24 | 6.6-7.3 | <2 | Moderate | High | Low |  |  | 7 |
|  | 17-46 | 0.6-2.0 | 0.15-0.19 | 6.6-7.3 | <2 | Moderate | High | Low |  |  |  |
|  | 46-60 | 0.2-0.6 | 0.05-0.19 | 7.4-8.4 | <2 | Moderate | High | Low |  |  |  |
| Crosby: CrA | 0-13 | 0.6-2.0 | 0.20-0.24 | 5.1-6.5 | <2 | Low | High | Moderate | 0.37 | 3-2 | 5 |
|  | 13-30 | 0.06-0.2 | 0.15-0.20 | 5.1-7.3 | <2 | Moderate | High | Moderate | 0.37 |  |  |
|  | 30-60 | 0.06-0.6 | 0.05-0.19 | 7.9-8.4 | <2 | Low | High | Low | 0.37 |  |  |
| CsB2[1]: Crosby part | 0-13 | 0.6-2.0 | 0.20-0.24 | 5.1-6.5 | <2 | Low | High | Moderate | 0.37 | 3-2 | 5 |
|  | 13-30 | 0.06-0.2 | 0.15-0.20 | 5.1-7.3 | <2 | Moderate | High | Moderate | 0.37 |  |  |
|  | 30-60 | 0.06-0.6 | 0.05-0.19 | 7.9-8.4 | <2 | Low | High | Low | 0.37 |  |  |
| Miami part | 0-14 | 0.6-2.0 | 0.20-0.24 | 5.6-7.3 | <2 | Low | Low | Moderate | 0.32 | 4-3 | 5 |
|  | 14-34 | 0.6-2.0 | 0.15-0.20 | 5.6-6.0 | <2 | Moderate | Moderate | Moderate | 0.32 |  |  |
|  | 34-60 | 0.06-2.0 | 0.05-0.19 | 6.6-8.4 | <2 | Low | Low | Low | 0.43 |  |  |
| Eel: Ee | 0-17 | 0.6-2.0 | 0.20-0.24 | 6.6-7.3 | <2 | Low | Moderate | Low |  |  | 5 |
|  | 17-40 | 0.6-2.0 | 0.17-0.22 | 6.6-7.8 | <2 | Low | Moderate | Low |  |  |  |
|  | 40-60 | 0.6-2.0 | 0.19-0.24 | 7.4-7.8 | <2 | Low | Moderate | Low |  |  |  |
| Fincastle: FnA | 0-12 | 0.6-2.0 | 0.22-0.24 | 5.1-6.5 | <2 | Low | High | Moderate | 0.37 | 4-3 | 5 |
|  | 12-33 | 0.2-0.6 | 0.18-0.20 | 5.1-5.5 | <2 | Moderate | High | Moderate | 0.37 |  |  |
|  | 33-45 | 0.06-0.6 | 0.15-0.19 | 5.1-6.0 | <2 | Moderate | High | Moderate | 0.37 |  |  |
|  | 45-60 | 0.06-0.6 | 0.05-0.19 | 7.4-8.4 | <2 | Low | High | Low | 0.37 |  |  |
| Fox: FoA, FoB2, FxC2[1] | 0-15 | 0.6-2.0 | 0.20-0.22 | 5.6-6.5 | <2 | Low | Low | Low | 0.32 | 3-2 | 6 |
|  | 15-34 | 0.6-2.0 | 0.12-0.14 | 6.1-7.8 | <2 | Moderate | Low | Low | 0.32 |  |  |
|  | 34-60 | >20 | 0.02-0.04 | 7.9-8.4 | <2 | Low | Low | Low | 0.10 |  |  |
| Genesee: Gs | 0-8 | 0.6-2.0 | 0.20-0.24 | 6.1-7.8 | <2 | Low | Low | Low |  |  | 5 |
|  | 8-40 | 0.6-2.0 | 0.17-0.22 | 6.1-8.4 | <2 | Low | Low | Low |  |  |  |
|  | 40-60 | 0.6-2.0 | 0.19-0.24 | 7.4-8.4 | <2 | Low | Low | Low |  |  |  |
| Hennepin: HaF | 0-6 | 0.6-2.0 | 0.18-0.24 | 6.1-7.8 | <2 | Low | Low | Low | 0.32 | 5-4 | 5 |
|  | 6-14 | 0.2-2.0 | 0.14-0.22 | 6.1-7.8 | <2 | Low | Low | Low | 0.32 |  |  |
|  | 14-60 | 0.2-2.0 | 0.07-0.11 | 6.1-8.4 | <2 | Low | Low | Low | 0.32 |  |  |
| Hickory: HkD2, HkF | 0-13 | 0.6-2.0 | 0.20-0.22 | 4.5-6.0 | <2 | Low | Low | High | 0.32 | 5-4 | 6 |
|  | 13-63 | 0.6-2.0 | 0.15-0.19 | 5.1-5.5 | <2 | Moderate | Moderate | Moderate | 0.32 |  |  |
|  | 63-73 | 0.6-2.0 | 0.11-0.19 | 5.1-8.4 | <2 | Low | Low | Low | 0.32 |  |  |
| Miami: MnB2, MnC2, MnD2, MnE | 0-14 | 0.6-2.0 | 0.20-0.24 | 5.6-7.3 | <2 | Low | Low | Moderate | 0.32 | 4-3 | 5 |
|  | 14-34 | 0.6-2.0 | 0.15-0.20 | 5.6-6.0 | <2 | Moderate | Moderate | Moderate | 0.32 |  |  |
|  | 34-60 | 0.06-2.0 | 0.05-0.19 | 6.6-8.4 | <2 | Low | Low | Low | 0.43 |  |  |
| MlB3, MlC3, MlD3 | 0-7 | 0.6-2.0 | 0.17-0.19 | 5.6-7.3 | <2 | Moderate | Moderate | Moderate | 0.32 |  | 4 |
|  | 7-34 | 0.6-2.0 | 0.15-0.20 | 5.6-6.0 | <2 | Moderate | Moderate | Moderate | 0.32 |  |  |
|  | 34-60 | 0.06-2.0 | 0.05-0.19 | 6.6-8.4 | <2 | Low | Low | Low | 0.43 |  |  |
| Muren: MuA | 0-14 | 0.6-2.0 | 0.22-0.24 | 5.1-6.0 | <2 | Low | Moderate | Moderate | 0.37 | 4-3 | 5 |
|  | 14-46 | 0.2-0.6 | 0.18-0.20 | 5.1-6.0 | <2 | Low | High | Moderate | 0.43 |  |  |
|  | 46-60 | 0.6-2.0 | 0.20-0.22 | 5.6-7.3 | <2 | Low | Moderate | Moderate | 0.43 |  |  |

# APPENDIX B. ( CONTINUED )

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Muskingum: MxG | 0-10 | 2.0-6.0 | 0.12-0.18 | 4.5-6.0 | <2 | Low | Low | High | 0.28 | 3 | 5 |
| | 10-25 | 0.6-2.0 | 0.08-0.14 | 4.5-5.5 | <2 | Low | Low | High | 0.28 | | |
| | 25-34 | 0.6-2.0 | 0.02-0.12 | 4.5-5.5 | <2 | Low | Low | High | 0.17 | | |
| | 34 | | | | | | | | | | |
| Nineveh: NnA | 0-8 | 0.6-2.0 | 0.20-0.22 | 6.0-7.3 | <2 | Low | Low | Low | 0.28 | 3-2 | 5 |
| | 8-27 | 0.6-2.0 | 0.15-0.19 | 6.0-7.3 | <2 | Low | Low | Low | 0.28 | | |
| | 27-36 | 0.6-2.0 | 0.13-0.16 | 6.6-7.8 | <2 | Low | Low | Low | 0.28 | | |
| | 36-60 | >20 | 0.02-0.01 | 7.4-8.4 | <2 | Low | Low | Low | 0.10 | | |
| Ockley: OcA, OcB2 | 0-11 | 0.6-2.0 | 0.20-0.21 | 5.6-6.5 | <2 | Low | Low | Moderate | 0.37 | 4-3 | 5 |
| | 11-22 | 0.6-2.0 | 0.15-0.20 | 4.5-6.0 | <2 | Moderate | Moderate | Moderate | 0.37 | | |
| | 22-50 | 0.6-2.0 | 0.12-0.14 | 5.6-6.5 | <2 | Moderate | Moderate | Moderate | 0.21 | | |
| | 50-60 | >20 | 0.02-0.01 | 7.4-8.1 | <2 | Low | Low | Low | 0.10 | | |
| Palms: Pa | 0-28 | 2.0-6.0 | 0.35-0.45 | 5.1-7.8 | <2 | | High | Moderate | | | 3 |
| | 28-60 | 0.6-2.0 | 0.05-0.19 | 6.1-8.4 | <2 | Low | High | Low | | | |
| Parke: PkB2, PkC2 | 0-13 | 0.6-2.0 | 0.22-0.24 | 5.1-6.5 | <2 | Low | Moderate | Moderate | 0.37 | 4-3 | 5 |
| | 13-36 | 0.6-2.0 | 0.18-0.20 | 4.5-5.0 | <2 | Low | Moderate | High | 0.37 | | |
| | 36-60 | 0.6-2.0 | 0.16-0.18 | 4.5-5.5 | <2 | Low | Moderate | High | 0.28 | | |
| Rensselaer: Re | 0-14 | 0.06-0.2 | 0.21-0.23 | 6.6-7.3 | <2 | Moderate | High | Low | | | 7 |
| | 14-42 | 0.06-0.2 | 0.15-0.19 | 6.6-7.3 | <2 | Moderate | High | Low | | | |
| | 42-60 | 0.6-2.0 | 0.19-0.21 | 7.9-8.4 | <2 | Low | High | Low | | | |
| Ross: Rs | 0-22 | 0.6-2.0 | 0.10-0.22 | 6.1-7.8 | <2 | Low | Low | Low | | | 5 |
| | 22-60 | 0.6-2.0 | 0.16-0.22 | 6.1-7.8 | <2 | Low | Low | Low | | | |
| Shoals: Sh | 0-8 | 0.6-2.0 | 0.22-0.24 | 6.6-7.3 | <2 | Low | High | Low | | | 5 |
| | 8-35 | 0.6-2.0 | 0.20-0.22 | 6.6-7.3 | <2 | Low | High | Low | | | |
| | 35-60 | 0.6-2.0 | 0.19-0.21 | 6.6-7.3 | <2 | Low | High | Low | | | |
| Sleeth: Sk | 0-17 | 0.6-2.0 | 0.20-0.24 | 6.6-7.3 | <2 | Low | High | Low | | | 5 |
| | 17-27 | 0.6-2.0 | 0.15-0.19 | 5.6-6.5 | <2 | Moderate | High | Low | | | |
| | 27-48 | 0.6-2.0 | 0.14-0.16 | 6.6-8.4 | <2 | Moderate | High | Low | | | |
| | 48-60 | >20 | 0.02-0.04 | 7.9-8.4 | <2 | Low | Low | Low | | | |
| Sloan: Sn | 0-14 | 0.6-2.0 | 0.20-0.24 | 6.1-7.8 | <2 | Moderate | High | Low | | | 5 |
| | 14-38 | 0.2-2.0 | 0.15-0.19 | 6.1-7.8 | <2 | Moderate | High | Low | | | |
| | 38-60 | 0.2-2.0 | 0.16-0.20 | 6.6-7.8 | <2 | Low | High | Low | | | |
| Wellston: WdC2 | 0-8 | 0.6-2.0 | 0.18-0.22 | 5.1-6.5 | <2 | Low | Moderate | Moderate | 0.32 | 4-3 | 5 |
| | 8-27 | 0.6-2.0 | 0.17-0.21 | 4.5-6.0 | <2 | Low | Moderate | High | | | |
| | 27-52 | 0.6-2.0 | 0.12-0.17 | 4.5-6.0 | <2 | Low | Moderate | High | | | |
| | 52 | | | | | | | | | | |
| Westland: We | 0-15 | 0.6-2.0 | 0.18-0.21 | 5.6-7.3 | <2 | Moderate | High | Low | | | 6 |
| | 15-38 | 0.06-0.2 | 0.15-0.19 | 5.6-7.3 | <2 | Moderate | High | Low | | | |
| | 38-48 | 0.06-0.2 | 0.14-0.16 | 5.6-7.3 | <2 | Moderate | High | Low | | | |
| | 48-60 | >20 | 0.02-0.01 | 7.4-8.4 | <2 | Low | High | Low | | | |
| Whitaker: Wh | 0-12 | 0.6-2.0 | 0.20-0.21 | 5.6-7.3 | <2 | Low | Moderate | Moderate | 0.37 | 5 | 5 |
| | 12-46 | 0.6-2.0 | 0.15-0.19 | 5.1-6.0 | <2 | Moderate | High | Moderate | 0.37 | | |
| | 46-60 | 0.6-6.0 | 0.19-0.21 | 6.6-8.4 | <2 | Low | High | Low | 0.37 | | |

# APPENDIX C

# ENGINEERING INDEX PROPERTIES OF AGRICULTURAL SOILS IN JOHNSON COUNTY (1)

# APPENDIX C. ENGINEERING INDEX PROPERTIES OF AGRICULTURAL SOILS IN JOHNSON COUNTY (1)

| Soil series and map symbols | Depth | USDA texture | Classification |  | Fragments >3 inches | Percentage passing sieve number— |  |  |  | Liquid limit | Plasticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  | Unified | AASHTO |  | 4 | 10 | 40 | 200 |  |  |
|  | *In* |  |  |  | *Pct* |  |  |  |  | *Pct* |  |
| Brookston: Br | 0-17 | Silty clay loam | CL | A-6, A-7 | 0 | 100 | 98-100 | 95-100 | 75-95 | 30-48 | 15-20 |
|  | 17-46 | Clay loam | CL, CH | A-6, A-7 | 0 | 98-100 | 90-100 | 85-95 | 75-85 | 36-52 | 18-30 |
|  | 46-60 | Loam | CL | A-4, A-6 | 0-3 | 90-100 | 85-95 | 78-90 | 55-70 | 22-30 | 7-15 |
| Crosby: CrA | 0-13 | Silt loam | CL, CL-ML | A-4, A-6 | 0 | 100 | 95-100 | 80-100 | 50-90 | 22-31 | 6-15 |
|  | 13-30 | Clay loam | CL, CH | A-6, A-7 | 0-3 | 92-99 | 89-97 | 78-93 | 64-76 | 37-55 | 17-31 |
|  | 30-60 | Loam | CL, ML, CL-ML | A-4, A-6 | 0-3 | 88-91 | 83-89 | 71-87 | 50-64 | 17-30 | 2-14 |
| CsB2¹: Crosby part | 0-13 | Silt loam | CL, CL-ML | A-4, A-6 | 0 | 100 | 95-100 | 80-100 | 50-90 | 22-31 | 6-15 |
|  | 13-30 | Clay loam | CL, CH | A-6, A-7 | 0-3 | 92-99 | 89-97 | 78-93 | 61-76 | 37-55 | 17-31 |
|  | 30-60 | Loam | CL, ML, CL-ML | A-4, A-6 | 0-3 | 88-91 | 83-89 | 71-87 | 50-61 | 17-30 | 2-14 |
| Miami part | 0-14 | Silt loam | CL, CL-ML | A-4, A-6 | 0 | 100 | 95-100 | 80-100 | 50-90 | 22-34 | 6-15 |
|  | 14-31 | Clay loam | CL | A-6, A-7 | 0 | 92-99 | 89-97 | 78-95 | 61-95 | 37-50 | 17-31 |
|  | 31-60 | Loam | CL, CL-ML | A-4, A-6 | 0-3 | 88-91 | 83-89 | 71-87 | 50-64 | 17-30 | 2-14 |
| Eel: Ee | 0-17 | Silt loam | ML, CL | A-4, A-6 | 0 | ... | 100 | 90-100 | 75-85 | 20-40 | 5-15 |
|  | 17-40 | Silt loam, loam | ML, CL | A-4, A-6 | 0 | ... | 100 | 90-100 | 75-85 | 20-40 | 5-15 |
|  | 40-60 | Stratified sandy loam to silt loam. | ML, CL | A-4, A-6 | 0 | 100 | 90-100 | 70-80 | 55-70 | 26-40 | 5-15 |
| Fincastle: FnA | 0-12 | Silt loam | CL, ML | A-4, A-6 | 0 | 100 | 95-100 | 90-100 | 75-93 | 27-36 | 4-12 |
|  | 12-33 | Silty clay loam | CL, CH | A-6, A-7 | 0 |  | 100 | 95-100 | 85-95 | 38-51 | 20-32 |
|  | 33-45 | Clay loam | CH, CL | A-7 | 0 | 95-100 | 90-98 | 85-95 | 75-85 | 45-58 | 30-38 |
|  | 45-60 | Loam | CL, ML | A-4 | 0-3 | 88-96 | 82-90 | 70-86 | 50-66 | 18-24 | 6-10 |
| Fox: FoA, FoB2, FxC2¹ | 0-15 | Loam | ML | A-4 | 0 | 95-100 | 90-100 | 75-95 | 55-90 | 20-30 | 2-4 |
|  | 15-34 | Sandy clay loam, gravelly sandy clay loam. | CL, SC | A-6 | 0 | 85-100 | 75-95 | 65-95 | 45-75 | 25-35 | 10-20 |
|  | 34-60 | Sand and gravel | SP, SP-SM | A-1 | 0-5 | 55-75 | 40-65 | 20-40 | 2-10 | ... | NP |
| Genesee: Ge | 0-8 | Loam | ML, CL | A-4, A-6 | 0 |  | 100 | 90-100 | 75-85 | 26-40 | 5-15 |
|  | 8-40 | Silt loam | ML, CL | A-4, A-6 | 0 | ... | 100 | 90-100 | 75-85 | 20-40 | 5-15 |
|  | 40-60 | Stratified sandy loam to silt loam. | ML, CL | A-4, A-6 | 0 | 100 | 90-100 | 70-80 | 50-70 | 26-40 | 5-15 |
| Hennepin: HaF | 0-6 | Loam | CL, CL-ML | A-4, A-6 | 0-5 | 90-100 | 85-100 | 70-100 | 60-95 | 25-40 | 5-20 |
|  | 6-14 | Loam | CL, CL-ML | A-4, A-6, A-7 | 0-5 | 85-100 | 80-100 | 65-100 | 60-95 | 20-50 | 5-25 |
|  | 14-60 | Loam | CL, CL-ML | A-4, A-6, A-7 | 0-5 | 85-100 | 80-100 | 65-100 | 60-95 | 20-50 | 5-25 |
| Hickory: HkD2, HkF | 0-13 | Silt loam | CL-ML, CL | A-6, A-4 | 0-5 | 95-100 | 90-100 | 90-100 | 85-95 | 20-35 | 5-15 |
|  | 13-63 | Clay loam | CL | A-6, A-7 | 0-5 | 95-100 | 90-100 | 80-95 | 75-90 | 30-50 | 15-30 |
|  | 63-73 | Loam | CL-ML, CL | A-4, A-6 | 0-5 | 85-100 | 85-95 | 80-95 | 60-80 | 20-40 | 5-20 |

# APPENDIX C ( CONTINUED )

| Soil series and map symbols | Depth | USDA texture | Classification | | Fragments >3 inches | Percentage passing sieve number— | | | | Liquid limit | Plasticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unified | AASHTO | | 4 | 10 | 40 | 200 | | |
| | *In* | | | | *Pct* | | | | | *Pct* | |
| Miami:<br>MnB2, MnC2, MnD2, MnE. | 0-14 | Silt loam | CL, CL-ML | A-4, A-6 | 0 | 100 | 95-100 | 80-100 | 50-90 | 22-34 | 6-15 |
| | 14-34 | Clay loam | CL | A-6, A-7 | 0 | 92-99 | 89-97 | 78-95 | 61-95 | 37-50 | 17-31 |
| | 34-60 | Loam | CL, CL-ML | A-4, A-6 | 0-3 | 88-91 | 83-89 | 71-87 | 50-61 | 17-30 | 2-14 |
| MtB3, MtC3, MtD3 | 0-7 | Clay loam | CL | A-6, A-7 | 0 | 95-100 | 90-100 | 80-100 | 65-85 | 35-50 | 15-25 |
| | 7-34 | Clay loam | CL | A-6, A-7 | 0 | 92-99 | 89-97 | 78-95 | 61-95 | 37-50 | 17-31 |
| | 34-60 | Loam | CL, CL-ML | A-4, A-6 | 0-3 | 88-91 | 83-89 | 71-87 | 50-61 | 17-30 | 2-14 |
| Muren: MuA | 0-14 | Silt loam | CL, CL-ML | A-4, A-6 | 0 | ... | 100 | 90-100 | 70-90 | 25-35 | 5-15 |
| | 14-40 | Silty clay loam | CL | A-6, A-7 | 0 | ... | 100 | 90-100 | 80-95 | 35-50 | 15-30 |
| | 40-60 | Silt loam | CL, CL-ML | A-4, A-6 | 0 | ... | 100 | 90-100 | 70-90 | 25-35 | 5-15 |
| Muskingum: MxG | 0-10 | Silt loam | ML, CL, SM, SC | A-2, A-4 | 0-10 | 75-100 | 70-95 | 50-90 | 30-80 | 20-35 | 2-10 |
| | 10-25 | Silt loam, channery silt loam. | GM, SM, ML, CL | A-4 | 0-15 | 70-90 | 55-85 | 50-80 | 40-75 | 20-35 | 2-10 |
| | 25-34 | Channery silt loam | GM, SM, ML | A-1, A-2, A-4 | 0-15 | 20-80 | 10-65 | 10-65 | 10-60 | 20-35 | 2-10 |
| | 34 | Unweathered bedrock. | | | | | | | | | |
| Nineveh: NnA | 0-8 | Loam | CL | A-4, A-6 | 0 | 95-100 | 95-100 | 85-95 | 60-75 | 20-35 | 10-15 |
| | 8-27 | Clay loam | CL | A-6, A-7 | 0 | 95-100 | 90-100 | 85-100 | 65-80 | 35-45 | 15-25 |
| | 27-30 | Gravelly clay loam, gravelly loam. | SC, CL | A-6, A-7 | 0-5 | 65-75 | 60-70 | 50-60 | 40-60 | 30-45 | 15-25 |
| | 30-60 | Stratified sand to very gravelly sand. | SP, GP, SP-SM | A-1 | 0-5 | 30-70 | 20-55 | 5-20 | 0-10 | ... | NP |
| Ockley: OcA, OcB2 | 0-11 | Loam | CL, ML | A-4, A-6 | 0 | 100 | 95-100 | 80-100 | 60-90 | 22-33 | 4-12 |
| | 11-22 | Clay loam | CL | A-4, A-6 | 0 | 100 | 75-100 | 65-90 | 50-90 | 20-35 | 8-17 |
| | 22-50 | Clay loam, sandy clay loam, gravelly loam. | CL, SC | A-6, A-7 | 0-2 | 70-85 | 45-75 | 40-70 | 35-55 | 30-45 | 11-25 |
| | 50-60 | Stratified sand to gravelly sand. | SP, SP-SM, GP | A-1 | 1-5 | 30-70 | 22-55 | 7-20 | 2-10 | <20 | NP |
| Palms: Pa | 0-28 | Muck | Pt. | | | | | | | | |
| | 28-60 | Silt loam, fine sandy loam | CL-ML, CL | A-4, A-6 | 0 | 85-100 | 80-100 | 70-95 | 50-80 | <30 | 5-15 |
| Parke: PkB2, PkC2 | 0-13 | Silt loam | CL, CL-ML | A-4, A-6 | 0 | ... | 100 | 90-100 | 70-100 | 25-35 | 5-15 |
| | 13-30 | Silty clay loam, loam, silt loam. | CL, CH | A-6, A-7 | 0 | 95-100 | 95-100 | 90-100 | 80-100 | 35-55 | 20-35 |
| | 30-60 | Loam | CL-ML, CL | A-4, A-6 | 0-3 | 90-100 | 85-95 | 75-90 | 60-80 | 25-35 | 5-15 |
| Rensselaer: Re | 0-14 | Silty clay loam | CL, CH | A-6, A-7 | 0 | ... | 100 | 95-100 | 85-95 | 40-51 | 20-32 |
| | 14-42 | Silty clay loam, loam | CL | A-6, A-7 | 0 | ... | 100 | 90-100 | 70-80 | 33-47 | 15-20 |
| | 42-60 | Stratified fine sand to clay loam. | CL, SC, CL-ML | A-4 | 0 | 98-100 | 98-100 | 91-100 | 40-60 | <30 | 4-9 |
| Ross: Rs | 0-22 | Loam | ML, CL-ML | A-4 | 0 | 90-100 | 90-100 | 80-100 | 65-90 | <40 | NP-10 |
| | 22-60 | Sandy clay loam, sandy loam. | ML, CL-ML, SC, SM-SC | A-4, A-6, A-2 | 0 | 90-100 | 90-100 | 65-90 | 30-55 | <40 | NP-12 |
| Shoals: Sh | 0-8 | Silt loam | ML, CL | A-4, A-6 | 0 | ... | ... | 90-100 | 65-90 | 22-36 | 6-15 |
| | 8-35 | Silt loam, loam | ML, CL | A-4, A-6 | 0 | ... | ... | 90-100 | 75-85 | 26-33 | 6-11 |
| | 35-60 | Stratified silt loam to sandy loam. | ML | A-4 | 0-3 | 95-100 | 90-100 | 70-80 | 55-70 | 32-40 | 3-8 |

# APPENDIX C ( CONTINUED )

| Soil series and map symbols | Depth | USDA texture | Classification |  | Frag-ments >3 inches | Percentage passing sieve number— |  |  |  | Liquid limit | Plasticity index |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  | Unified | AASHTO |  | 4 | 10 | 40 | 200 |  |  |
| Sleeth: Sk | 0-17 | Loam | CL, ML | A-4, A-6 | 0 | 100 | 90-100 | 75-95 | 50-85 | 22-30 | 4-12 |
|  | 17-27 | Clay loam | CL | A-6 | 0 | 85-95 | 85-95 | 80-90 | 65-75 | 30-40 | 20-30 |
|  | 27-48 | Gravelly clay loam | CL | A-6 | 0-3 | 65-75 | 60-70 | 55-70 | 50-70 | 30-40 | 20-30 |
|  | 48-60 | Stratified sand to gravelly sand. | SP, GP, SP-SM | A-1 | 1-5 | 30-70 | 22-55 | 7-20 | 2-10 | ........ | NP |
| Sloan: Sn | 0-14 | Clay loam, silty clay loam | CL, ML | A-6, A-4, A-7 | 0 | 100 | 95-100 | 85-100 | 70-95 | 30-50 | 8-15 |
|  | 14-38 | Clay loam | CL, ML | A-6, A-7, A-4 | 0 | 100 | 90-100 | 85-100 | 75-95 | 30-45 | 8-18 |
|  | 38-60 | Stratified loam to silty clay loam. | ML, CL | A-4, A-6 | 0 | 95-100 | 90-100 | 80-95 | 65-90 | 25-40 | 0-4 |
| Wellston: WdC2 | 0-8 | Silt loam | ML | A-4 | 0 | 95-100 | 90-100 | 85-100 | 70-95 | 26-34 | 4-10 |
|  | 8-27 | Silt loam, silty clay loam | CL, ML | A-6, A-4 | 0-5 | 75-100 | 70-100 | 60-95 | 60-90 | 25-40 | 5-18 |
|  | 27-52 | Silt loam | ML, CL, GM | A-4, A-6 | 0-10 | 65-90 | 65-90 | 60-90 | 40-65 | 20-35 | 5-14 |
|  | 52 | Unweathered bedrock. |  |  |  |  |  |  |  |  |  |
| Westland: We | 0-15 | Clay loam | CL | A-6 | 0 | 95-100 | 90-100 | 85-95 | 65-75 | 27-38 | 11-20 |
|  | 15-38 | Clay loam | CL | A-6 | 0 | 95-100 | 90-100 | 80-90 | 65-75 | 30-40 | 20-30 |
|  | 38-48 | Gravelly clay loam | CL | A-6 | 0-5 | 65-75 | 60-70 | 55-70 | 50-70 | 30-40 | 20-30 |
|  | 48-60 | Stratified sand to gravelly sand. | SP, GP, SP-SM | A-1 | 1-5 | 30-70 | 22-55 | 7-20 | 2-10 | ........ | NP |
| Whitaker: Wh | 0-12 | Silt loam | CL, CL-ML | A-4, A-6 | 0 | 100 | 95-100 | 80-100 | 60-90 | 22-33 | 4-12 |
|  | 12-46 | Clay loam, loam | CL | A-6, A-7 | 0 | 100 | 95-100 | 90-100 | 70-80 | 30-47 | 12-26 |
|  | 46-60 | Stratified coarse sand to silt clay loam. | CL, SC, CL, ML, SM | A-1 | 0 | 98-100 | 98-100 | 91-100 | 40-60 | 5-21 | 4-9 |

# APPENDIX D

## STATISTICAL STREAM FLOW DATA FOR SELECTED STREAMS IN JOHNSON COUNTY (35)

# APPENDIX D-1. STATISTICAL STREAM FLOW DATA FOR YOUNGS CREEK ( 35 )

03362000 YOUNGS CREEK NEAR EDINBURGH, IN

LOCATION.--Lat 39°25'08", long 86°00'18", in SE¼SW¼ sec.5, T.11 N., R.5 E., Johnson County, Hydrologic Unit 05120204, on left bank on upstream side of county highway bridge, 0.5 mi southwest of Amity, 2.0 mi upstream from mouth, and 5 mi northwest of Edinburgh.

DRAINAGE AREA.--107 $mi^2$.

PERIOD OF RECORD.--October 1942 to September 1985. Prior to December 1942 monthly discharge only, published in WSP 1305. Prior to October 1977, published as "near Edinburg".

GAGE.--Water-stage recorder. Datum of gage is 670.20 ft above National Geodetic Vertical Datum of 1929. Prior to June 30, 1955, nonrecording gage at same site and datum.

AVERAGE DISCHARGE.--43 years, 107 $ft^3/s$, 13.58 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 10,700 $ft^3/s$ Jan. 27, 1952, gage height, 13.4 ft; minimum daily, 0.5 $ft^3/s$ Sept. 29, Oct. 20, 21, 1953.

DURATION TABLE OF DAILY MEAN DISCHARGES FOR YEAR ENDING SEPTEMBER 30

| CLASS | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR |  |  |  |  |  |  |  |  |  |  |  |  |  | NUMBER OF DAYS IN CLASS |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1944 |  |  | 2 | 12 | 9 | 10 | 35 | 28 | 40 | 30 | 23 | 21 | 28 | 9 | 6 | 4 | 7 | 10 | 17 | 21 | 13 | 9 | 8 | 8 | 3 | 3 | 4 | 2 | 1 | 2 |  |  | 1 |  |  |
| 1945 |  |  |  |  |  | 5 | 14 | 50 | 48 | 30 | 28 | 9 | 6 | 5 | 15 | 9 | 15 | 24 | 13 | 18 | 12 | 10 | 13 | 5 | 14 | 11 | 3 | 3 |  | 3 | 2 |  |  |  |  |
| 1946 |  |  |  |  |  | 8 | 8 | 9 | 18 | 8 | 7 | 10 | 24 | 27 | 29 | 20 | 22 | 26 | 35 | 25 | 26 | 15 | 19 | 7 | 6 | 7 | 4 | 2 | 1 | 2 |  |  |  |  |  |
| 1947 |  |  | 2 |  | 13 | 1 | 3 | 3 | 9 | 21 | 28 | 17 | 24 | 17 | 18 | 19 | 23 | 24 | 22 | 22 | 30 | 13 | 19 | 10 | 7 | 7 | 3 | 5 | 3 |  | 1 |  | 1 |  |  |
| 1948 |  |  |  |  |  |  | 15 | 20 | 29 | 20 | 34 | 32 | 46 | 17 | 11 | 17 | 21 | 12 | 17 | 15 | 12 | 10 | 8 | 7 | 8 | 1 | 7 | 4 | 2 | 1 |  |  |  |  |  |
| 1949 |  |  |  |  |  | 1 | 7 | 5 | 22 | 20 | 13 | 13 | 26 | 23 | 21 | 12 | 28 | 24 | 30 | 22 | 24 | 12 | 19 | 14 | 11 | 3 | 3 | 5 | 2 | 3 | 1 |  |  | 1 |  |
| 1950 |  |  |  |  |  |  |  | 2 | 1 | 28 | 30 | 9 | 32 | 14 | 11 | 20 | 24 | 28 | 29 | 26 | 24 | 18 | 20 | 6 | 16 | 3 | 4 | 11 | 3 | 2 | 3 |  | 1 |  |  |
| 1951 |  |  |  |  |  |  | 3 | 8 | 7 | 37 | 14 | 4 | 12 | 10 | 14 | 15 | 40 | 29 | 28 | 25 | 21 | 18 | 16 | 15 | 21 | 11 | 6 | 4 | 3 | 1 | 3 |  |  |  |  |
| 1952 |  |  |  |  |  | 3 | 8 | 12 | 33 | 29 | 19 | 2 | 8 | 9 | 20 | 18 | 19 | 23 | 15 | 25 | 19 | 17 | 27 | 16 | 13 | 7 | 11 | 4 | 4 | 3 |  | 1 |  | 1 |  |
| 1953 |  | 1 |  | 5 | 5 | 13 | 28 | 19 | 29 | 19 | 11 | 8 | 36 | 17 | 15 | 12 | 17 | 24 | 25 | 20 | 21 | 12 | 9 | 7 | 3 | 6 | 1 | 1 |  | 1 |  |  |  |  |  |
| 1954 |  | 5 | 7 | 14 | 16 | 43 | 51 | 30 | 20 | 12 | 12 | 10 | 22 | 21 | 16 | 18 | 26 | 22 | 5 | 4 | 5 | 2 | 2 |  | 2 |  |  |  |  |  |  |  |  |  |  |
| 1955 |  |  |  |  | 1 | 6 | 24 | 30 | 44 | 20 | 11 | 13 | 12 | 25 | 22 | 27 | 24 | 19 | 21 | 15 | 19 | 7 | 10 |  | 7 | 2 | 4 | 2 |  |  |  |  |  |  |  |
| 1956 |  |  |  |  |  |  |  | 2 | 14 | 12 | 10 | 5 | 14 | 42 | 37 | 32 | 30 | 22 | 22 | 25 | 16 | 18 | 17 | 18 | 9 | 9 | 3 | 5 | 1 | 1 | 1 |  |  | 1 |  |
| 1957 |  |  |  |  |  |  | 8 | 4 | 22 | 25 | 20 | 13 | 10 | 21 | 14 | 17 | 33 | 34 | 29 | 19 | 30 | 14 | 11 | 6 | 9 | 10 | 1 | 6 | 5 |  | 1 | 1 | 1 | 1 |  |
| 1958 |  |  |  |  |  |  |  |  | 1 | 15 | 13 | 1 | 7 | 7 | 21 | 21 | 48 | 60 | 36 | 28 | 25 | 18 | 14 | 7 | 16 | 5 | 10 | 7 |  | 2 | 2 |  | 1 |  |  |
| 1959 |  |  |  |  |  |  | 4 | 13 | 15 | 12 | 10 | 10 | 10 | 15 | 31 | 26 | 44 | 24 | 26 | 24 | 32 | 15 | 17 | 11 | 11 | 5 | 5 | 2 |  |  | 2 |  | 1 |  |  |
| 1960 |  |  |  |  |  |  |  | 5 | 19 | 17 | 50 | 13 | 19 | 11 | 38 | 35 | 27 | 28 | 26 | 15 | 20 | 11 | 9 | 8 | 8 |  | 2 |  | 2 | 2 | 1 |  |  |  |  |
| 1961 |  |  |  |  |  | 8 | 10 | 19 | 34 | 43 | 49 | 25 | 22 | 13 | 11 | 7 | 25 | 18 | 9 | 9 | 8 | 7 | 7 | 7 | 14 | 8 | 3 | 2 | 4 |  | 1 |  | 1 | 1 |  |
| 1962 |  |  |  |  |  |  |  | 4 | 22 | 10 | 30 | 13 | 24 | 28 | 22 | 30 | 29 | 33 | 26 | 24 | 22 | 12 | 10 | 4 | 7 | 5 | 2 | 4 | 2 |  |  | 2 |  |  |  |
| 1963 |  |  |  |  |  |  |  |  | 5 | 52 | 83 | 24 | 34 | 24 | 28 | 16 | 22 | 16 | 12 | 11 | 6 | 8 | 7 | 7 | 2 | 1 | 2 | 2 |  | 2 |  |  |  | 1 |  |
| 1964 |  |  |  |  |  | 23 | 42 | 54 | 24 | 30 | 25 | 11 | 30 | 25 | 13 | 12 | 6 | 12 | 9 | 6 | 10 | 3 | 5 | 6 | 6 | 2 | 4 | 2 | 1 | 2 | 1 |  | 2 |  |  |
| 1965 |  |  |  |  | 1 | 15 | 4 | 12 | 30 | 44 | 29 | 15 | 13 | 13 | 19 | 26 | 23 | 20 | 15 | 22 | 12 | 10 | 14 | 9 | 8 | 4 | 4 | 1 | 1 |  |  | 1 |  |  |  |
| 1966 |  |  |  |  |  | 3 | 8 | 18 | 14 | 12 | 13 | 11 | 42 | 39 | 50 | 35 | 30 | 29 | 13 | 14 | 13 | 7 | 4 | 4 |  | 3 | 1 | 2 |  |  |  |  |  |  |  |
| 1967 |  |  |  |  |  |  | 6 | 34 | 28 | 21 | 11 | 11 | 12 | 10 | 8 | 10 | 25 | 43 | 27 | 27 | 25 | 10 | 15 | 12 | 11 | 6 | 5 | 2 | 1 | 1 | 2 | 2 |  |  |  |
| 1968 |  |  |  |  |  |  | 1 | 6 | 9 | 25 | 22 | 21 | 17 | 26 | 32 | 37 | 25 | 23 | 19 | 17 | 20 | 16 | 11 | 9 | 8 | 8 | 4 | 2 | 4 | 2 |  | 1 |  |  | 1 |
| 1969 |  |  |  |  |  |  |  |  |  | 22 | 17 | 17 | 21 | 20 | 21 | 40 | 42 | 42 | 26 | 16 | 13 | 13 | 17 | 10 | 12 | 1 | 5 | 2 | 3 | 2 | 1 |  | 2 |  |  |
| 1970 |  |  |  |  |  |  |  | 4 | 25 | 23 | 18 | 8 | 18 | 13 | 21 | 33 | 32 | 47 | 29 | 29 | 18 | 10 | 15 | 8 | 5 | 4 | 1 | 3 | 1 |  |  |  |  |  |  |
| 1971 |  |  |  |  |  |  | 1 | 30 | 25 | 21 | 28 | 18 | 29 | 28 | 36 | 23 | 27 | 25 | 13 | 14 | 15 | 9 | 5 | 3 | 4 | 3 | 4 |  | 2 | 1 | 1 |  |  |  |  |
| 1972 |  |  |  |  |  |  | 2 | 29 | 58 | 22 | 12 | 9 | 14 | 11 | 20 | 30 | 48 | 36 | 22 | 15 | 8 | 4 | 9 | 5 | 4 | 3 | 1 | 2 | 1 |  | 1 |  |  |  |  |
| 1973 |  |  |  |  |  |  |  |  |  | 2 | 29 | 9 | 16 | 12 | 11 | 24 | 24 | 42 | 29 | 27 | 32 | 24 | 22 | 14 | 19 | 10 | 12 | 2 | 5 |  |  |  |  |  |  |
| 1974 |  |  |  |  |  |  |  |  | 1 | 8 | 28 | 10 | 22 | 21 | 20 | 15 | 29 | 41 | 31 | 30 | 33 | 19 | 15 | 11 | 10 | 7 | 6 | 4 | 4 |  |  |  |  |  |  |
| 1975 |  |  |  |  |  |  |  | 5 | 13 | 23 | 14 | 7 | 8 | 10 | 28 | 23 | 18 | 27 | 24 | 34 | 37 | 18 | 26 | 17 | 13 | 7 | 5 | 5 | 1 |  | 1 | 1 |  |  |  |
| 1976 |  |  |  |  |  |  |  | 3 | 19 | 15 | 16 | 11 | 26 | 33 | 34 | 24 | 29 | 30 | 28 | 30 | 24 | 9 | 10 | 3 | 11 | 3 | 5 | 3 |  |  |  |  |  |  |  |
| 1977 |  |  |  |  |  | 2 | 8 | 34 | 14 | 46 | 53 | 28 | 39 | 22 | 19 | 18 | 18 | 16 | 7 | 6 | 9 | 3 | 7 | 5 | 2 | 5 | 3 | 1 |  |  |  |  |  |  |  |
| 1978 |  |  |  |  |  |  |  |  |  |  | 8 | 8 | 26 | 24 | 51 | 35 | 36 | 36 | 25 | 20 | 19 | 14 | 18 | 10 | 11 | 7 | 8 | 1 | 3 | 4 |  | 1 |  |  |  |
| 1979 |  |  |  |  |  |  |  |  |  | 2 | 8 |  | 1 | 26 | 22 | 35 | 44 | 45 | 43 | 36 | 19 | 13 | 17 | 17 | 7 | 10 | 7 | 2 | 2 | 5 | 2 | 1 |  | 1 |  |
| 1980 |  |  |  |  |  |  |  |  |  |  | 1 | 11 | 31 | 30 | 26 | 33 | 45 | 37 | 29 | 20 | 29 | 12 | 20 | 15 | 11 | 8 | 2 | 4 | 2 |  |  |  |  |  |  |
| 1981 |  |  |  |  |  |  |  | 1 | 4 | 9 | 51 | 26 | 52 | 36 | 40 | 19 | 13 | 15 | 16 | 15 | 14 | 14 | 12 | 9 | 3 | 4 | 3 | 4 |  |  | 3 |  |  |  |  |
| 1982 |  |  |  |  |  |  |  | 3 | 40 | 17 | 40 | 23 | 23 | 12 | 21 | 25 | 22 | 21 | 17 | 18 | 25 | 11 | 10 | 7 | 9 | 8 | 2 | 6 | 1 | 2 | 1 | 1 |  |  |  |
| 1983 |  |  |  |  |  |  |  | 24 | 37 | 38 | 13 | 10 | 15 | 14 | 17 | 30 | 31 | 36 | 25 | 22 | 12 | 11 | 8 | 7 | 3 | 3 | 4 | 3 |  | 2 |  |  |  |  |  |
| 1984 |  |  |  |  |  |  | 1 | 11 | 27 | 15 | 18 | 12 | 22 | 18 | 14 | 24 | 21 | 15 | 12 | 45 | 41 | 19 | 20 | 12 | 7 | 3 | 5 | 2 | 1 |  |  | 1 |  |  |  |
| 1985 |  |  |  |  |  |  |  |  | 6 | 5 | 8 | 17 | 24 | 34 | 33 | 25 | 28 | 30 | 29 | 28 | 29 | 9 | 18 | 14 | 7 | 6 | 3 | 7 | 1 | 2 | 1 | 1 |  |  |  |

# APPENDIX D-1 (CONTINUED)

```
CLASS   VALUE   TOTAL   ACCUM   PERCT        CLASS   VALUE   TOTAL   ACCUM   PERCT        CLASS   VALUE   TOTAL   ACCUM   PERCT
  0     0.00        0   15341  100.00         12      11.0     917   11115   72.45         24     340.0     358    1060    6.91
  1     0.50        6   15341  100.00         13      15.0     832   10198   66.48         25     460.0     219     702    4.58
  2     0.66       11   15335   99.96         14      20.0     956    9366   61.05         26     610.0     172     483    3.15
  3     0.88       31   15324   99.89         15      27.0     951    8410   54.82         27     810.0     131     311    2.03
  4     1.2        45   15293   99.69         16      35.0    1140    7459   48.62         28    1100.0      67     180    1.17
  5     1.6       141   15248   99.39         17      47.0    1168    6319   41.19         29    1400.0      48     113    0.74
  6     2.1       291   15107   98.47         18      63.0     931    5151   33.58         30    1900.0      32      65    0.42
  7     2.8       531   14816   96.58         19      83.0     884    4220   27.51         31    2500.0      14      33    0.22
  8     3.7       806   14285   93.12         20     110.0     842    3336   21.75         32    3300.0      11      19    0.12
  9     4.9       860   13479   87.86         21     150.0     504    2494   16.26         33    4400.0       7       8    0.05
 10     6.4       957   12619   82.26         22     190.0     560    1990   12.97         34    5900.0       1       1    0.01
 11     8.6       547   11662   76.02         23     260.0     370    1430    9.32


VALUE EXCEEDEO 'P' PERCENT OF TIME
P95 •        3.2
P90 •        4.4
P75 •        9.3
P70 •       12.6
P50 •       33.2
P25 •       94.8
P10 •      247.0
```

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             LOWEST MEAN DISCHARGE AHO RANKING FOR THE FOLLOWING NUMBER OF CONSECUTIVE OAYS IN YEAR ENOING MARCH 31

YEAR        1          3          7          14         30         60         90         120         183
1944     1.80  6    1.80  6    2.10  8    2.70 11    3.20 11    4.30 13    4.50  8    5.70 10    13.00 13
1945     0.80  3    0.83  3    0.93  2    1.10  2    1.40  1    3.10  4    4.40  7    4.50  6     5.30  3

1946     2.70 22    2.80 21    3.20 22    3.50 22    3.80 20   11.00 35   16.00 35   48.00 39    49.00 35
1947     0.80  4    0.93  4    1.30  3    1.50  3    2.20  5    4.30 14    4.90 10    8.10 17    15.00 15
1948     2.80 25    2.80 22    3.30 23    3.60 24    4.10 25    5.60 21    6.80 21    7.90 16    16.00 17
1949     2.00 14    2.20 12    2.30 10    2.40  9    2.60  7    3.70  8    6.20 18   28.00 36    37.00 31
1950     2.50 19    2.60 17    3.00 19    4.70 31    7.50 34   14.00 37   15.00 34   19.00 30    22.00 24

1951     4.90 36    5.00 33    5.40 34    5.60 32    6.10 31   10.00 33   20.00 36   19.00 31    38.00 32
1952     1.90 10    2.30 15    2.90 16    3.30 19    3.80 21    4.10 12    5.00 11   11.00 24    48.00 34
1953     1.80  7    1.80  7    2.00  6    2.20  6    2.50  6    3.40  5    4.10  6    4.60  7     8.50  9
1954     0.50  1    0.53  1    0.73  1    0.86  1    1.40  2    2.00  1    2.40  1    2.80  2     3.40  2
1955     0.60  2    0.77  2    1.30  4    1.70  5    2.10  3    2.20  2    2.40  2    2.70  1     3.30  1

1956     1.90 11    2.20 13    2.40 11    2.90 13    3.20 12    5.20 20   12.00 32   17.00 29    35.00 30
1957     2.10 15    2.20 14    2.70 14    3.00 14    3.50 16    4.40 15    5.40 15    7.50 14    21.00 23
1958     4.70 33    5.30 36    5.60 35    5.70 33    8.00 35    9.30 31   11.00 30   24.00 33    97.00 41
1959    18.00 42   18.00 42   20.00 42   24.00 42   25.00 42   47.00 42   54.00 42   68.00 41    83.00 40
1960     2.70 23    2.70 18    2.90 17    3.00 15    3.70 18    5.80 23    6.60 19    8.40 18    15.00 16

1961     1.80  8    1.80  8    2.00  7    2.30  7    2.80  8    4.00 11    5.20 12    5.40  8     8.00  8
1962     2.20 16    2.70 19    3.10 20    3.10 17    4.00 22    5.70 22    6.10 17    7.60 15    12.00 12
1963     4.80 34    5.00 34    5.30 33    6.10 35    6.50 33    7.40 28    7.60 25    8.60 20    14.00 14
1964     2.00 12    2.10 10    2.20  9    2.30  8    2.80  9    3.60  6    3.40  4    4.00  4     7.60  7
1965     1.40  5    1.50  5    1.60  5    1.60  4    2.10  4    2.60  3    2.80  3    3.60  3     5.80  4

1966     3.60 31    3.60 31    3.80 29    4.20 27    5.60 28   13.00 36   21.00 37   24.00 34    28.00 27
1967     2.00 13    2.20 11    2.60 13    2.70 12    3.40 14    4.50 16    7.10 22   11.00 25    20.00 20
1968     2.20 17    2.40 16    2.90 18    3.00 16    3.30 13    3.80  9    4.60  9    5.50  9    11.00 10
1969     4.40 32    4.60 32    4.80 32    5.90 34    6.30 32    7.20 27    7.50 24   23.00 32    44.00 33
1970     8.30 40    8.60 40    9.60 40   13.00 40   14.00 40   17.00 40   29.00 40   58.00 40    63.00 37

1971     3.20 29    3.50 28    3.80 30    4.30 28    4.60 26    4.90 18    5.90 16    7.20 13    11.00 11
1972     2.50 18    2.90 23    3.10 21    3.20 18    3.50 15    3.70  7    4.00  5    4.10  5     6.70  5
1973     2.70 24    3.20 26    3.50 26    3.50 23    3.70 19    5.00 19    8.70 28    9.80 22    28.00 28
1974     6.00 37    6.10 37    6.50 36    7.60 38   10.00 39   11.00 34   14.00 33   26.00 35    66.00 38
1975     4.80 35    5.30 35    7.20 39    8.10 39    8.50 36   16.00 39   24.00 38   33.00 38    56.00 36

1976     3.00 27    3.40 27    3.70 27    4.30 29    5.20 27    6.50 26    8.20 26   15.00 27    31.00 29
1977     1.90  9    2.00  9    2.40 12    2.60 10    3.00 10    4.00 10    5.30 13    6.50 12     7.60  6
1978     2.60 20    2.70 20    2.80 15    3.40 20    5.80 30    8.10 30   10.00 29   16.00 28    20.00 21
1979     6.00 38    6.30 38    6.90 37    7.20 36    9.40 38   15.00 38   25.00 39   32.00 37    68.00 39
1980    16.00 41   16.00 41   17.00 41   18.00 41   20.00 41   26.00 41   46.00 41   98.00 42   109.00 42

1981     6.60 39    7.00 39    7.00 38    7.30 37    9.20 37    9.70 32   12.00 31   12.00 26    21.00 22
1982     3.40 30    3.60 29    4.00 31    4.70 30    5.70 29    7.60 29    8.50 27    9.30 21    25.00 25
1983     2.90 26    3.00 24    3.40 25    3.90 25    4.00 23    4.50 17    5.40 14    6.30 11    17.00 18
1984     2.80 21    3.00 25    3.30 24    3.40 21    3.60 17    6.00 25    6.60 20   11.00 23    27.00 26
1985     3.20 28    3.60 30    3.70 28    3.90 26    4.10 24    5.90 24    7.10 23    8.50 19    20.00 19
```

# APPENDIX D-1 (CONTINUED)

HIGHEST MEAN DISCHARGE AND RANKING FOR THE FOLLOWING NUMBER OF CONSECUTIVE DAYS IN YEAR ENDING SEPTEMBER 30

| YEAR | 1 | 3 | 7 | 15 | 30 | 60 | 90 | 120 | 183 |
|---|---|---|---|---|---|---|---|---|---|
| 1944 | 3610.00 11 | 2400.00 9 | 1410.00 7 | 757.00 15 | 497.00 16 | 345.00 18 | 282.00 16 | 221.00 22 | 152.00 28 |
| 1945 | 2380.00 25 | 1660.00 23 | 1150.00 18 | 666.00 18 | 482.00 20 | 382.00 11 | 288.00 15 | 266.00 10 | 198.00 17 |
| 1946 | 1800.00 30 | 1270.00 30 | 733.00 32 | 396.00 35 | 260.00 37 | 214.00 35 | 220.00 27 | 179.00 31 | 167.00 26 |
| 1947 | 3410.00 15 | 2030.00 16 | 1410.00 8 | 773.00 12 | 492.00 18 | 399.00 9 | 316.00 9 | 248.00 18 | 219.00 12 |
| 1948 | 1450.00 32 | 905.00 34 | 696.00 33 | 445.00 33 | 381.00 26 | 254.00 28 | 217.00 29 | 187.00 29 | 136.00 33 |
| 1949 | 4490.00 8 | 2460.00 8 | 1230.00 16 | 769.00 14 | 694.00 2 | 487.00 2 | 398.00 3 | 332.00 4 | 244.00 7 |
| 1950 | 3610.00 12 | 2390.00 10 | 1510.00 4 | 1250.00 1 | 866.00 1 | 625.00 1 | 482.00 1 | 410.00 1 | 298.00 1 |
| 1951 | 2290.00 26 | 1490.00 26 | 868.00 26 | 568.00 23 | 359.00 29 | 332.00 19 | 297.00 10 | 282.00 8 | 249.00 5 |
| 1952 | 5880.00 2 | 3240.00 2 | 1550.00 3 | 1000.00 3 | 585.00 6 | 484.00 3 | 398.00 4 | 370.00 2 | 294.00 2 |
| 1953 | 1450.00 33 | 890.00 36 | 524.00 37 | 353.00 38 | 261.00 36 | 180.00 38 | 183.00 35 | 155.00 35 | 123.00 37 |
| 1954 | 381.00 42 | 272.00 42 | 166.00 42 | 99.00 42 | 81.00 42 | 66.00 42 | 52.00 42 | 48.00 42 | 38.00 42 |
| 1955 | 960.00 41 | 589.00 41 | 498.00 40 | 299.00 40 | 241.00 39 | 176.00 40 | 147.00 40 | 131.00 39 | 105.00 39 |
| 1956 | 4610.00 7 | 2520.00 6 | 1250.00 12 | 712.00 17 | 405.00 23 | 260.00 26 | 213.00 31 | 213.00 25 | 183.00 21 |
| 1957 | 4620.00 6 | 2290.00 11 | 1430.00 5 | 870.00 8 | 518.00 13 | 459.00 6 | 366.00 5 | 355.00 3 | 273.00 3 |
| 1958 | 3420.00 14 | 1690.00 22 | 1250.00 13 | 739.00 16 | 514.00 14 | 375.00 12 | 297.00 11 | 251.00 15 | 194.00 19 |
| 1959 | 3730.00 10 | 2260.00 13 | 1100.00 19 | 597.00 21 | 506.00 15 | 362.00 16 | 279.00 17 | 251.00 16 | 201.00 15 |
| 1960 | 2150.00 27 | 1390.00 27 | 849.00 27 | 492.00 27 | 324.00 33 | 206.00 36 | 174.00 36 | 157.00 34 | 135.00 34 |
| 1961 | 5700.00 3 | 3470.00 1 | 1820.00 2 | 954.00 5 | 659.00 3 | 465.00 5 | 416.00 2 | 326.00 5 | 220.00 11 |
| 1962 | 2820.00 20 | 2080.00 15 | 1060.00 20 | 524.00 26 | 363.00 28 | 243.00 31 | 221.00 26 | 186.00 30 | 159.00 27 |
| 1963 | 5560.00 4 | 2950.00 4 | 1410.00 6 | 809.00 11 | 555.00 9 | 315.00 22 | 217.00 30 | 169.00 32 | 129.00 35 |
| 1964 | 4130.00 9 | 2520.00 7 | 1350.00 11 | 771.00 13 | 522.00 12 | 474.00 4 | 329.00 8 | 251.00 17 | 170.00 24 |
| 1965 | 2960.00 17 | 1580.00 24 | 869.00 25 | 466.00 31 | 388.00 24 | 251.00 29 | 242.00 24 | 198.00 26 | 142.00 30 |
| 1966 | 1000.00 40 | 750.00 39 | 461.00 41 | 275.00 41 | 180.00 41 | 140.00 41 | 116.00 41 | 99.00 41 | 84.00 40 |
| 1967 | 2780.00 22 | 2210.00 14 | 1370.00 10 | 1040.00 2 | 595.00 5 | 365.00 15 | 291.00 13 | 260.00 13 | 228.00 10 |
| 1968 | 6260.00 1 | 3180.00 3 | 1830.00 1 | 981.00 4 | 562.00 8 | 326.00 21 | 263.00 21 | 260.00 14 | 229.00 9 |
| 1969 | 3490.00 13 | 2270.00 12 | 1220.00 17 | 870.00 9 | 583.00 7 | 373.00 13 | 290.00 14 | 236.00 19 | 187.00 20 |
| 1970 | 1150.00 37 | 787.00 37 | 516.00 39 | 374.00 36 | 243.00 38 | 178.00 39 | 174.00 37 | 154.00 36 | 138.00 32 |
| 1971 | 2020.00 28 | 1280.00 29 | 1010.00 21 | 644.00 19 | 435.00 21 | 270.00 25 | 202.00 32 | 164.00 33 | 126.00 36 |
| 1972 | 1930.00 29 | 1090.00 31 | 782.00 29 | 534.00 25 | 337.00 32 | 223.00 34 | 174.00 38 | 146.00 38 | 113.00 38 |
| 1973 | 1300.00 34 | 894.00 35 | 607.00 35 | 475.00 28 | 421.00 22 | 329.00 20 | 262.00 22 | 234.00 20 | 231.00 8 |
| 1974 | 1290.00 35 | 1070.00 32 | 678.00 34 | 470.00 30 | 343.00 31 | 254.00 27 | 221.00 25 | 219.00 23 | 198.00 16 |
| 1975 | 2900.00 18 | 1950.00 17 | 1010.00 22 | 596.00 22 | 486.00 19 | 397.00 10 | 348.00 6 | 309.00 6 | 248.00 6 |
| 1976 | 1050.00 39 | 777.00 38 | 527.00 36 | 307.00 39 | 274.00 35 | 228.00 33 | 218.00 28 | 195.00 27 | 144.00 29 |
| 1977 | 1090.00 38 | 623.00 40 | 519.00 38 | 371.00 37 | 222.00 40 | 183.00 37 | 148.00 39 | 116.00 40 | 83.00 41 |
| 1978 | 2560.00 23 | 1890.00 19 | 1240.00 14 | 853.00 10 | 493.00 17 | 311.00 23 | 276.00 19 | 265.00 11 | 195.00 18 |
| 1979 | 5340.00 5 | 2580.00 5 | 1230.00 15 | 936.00 6 | 606.00 4 | 400.00 8 | 292.00 12 | 263.00 12 | 269.00 4 |
| 1980 | 1270.00 36 | 983.00 33 | 748.00 31 | 446.00 32 | 315.00 34 | 241.00 32 | 184.00 33 | 187.00 28 | 176.00 23 |
| 1981 | 2420.00 24 | 1930.00 18 | 1390.00 9 | 872.00 7 | 553.00 10 | 371.00 14 | 269.00 20 | 222.00 21 | 167.00 25 |
| 1982 | 3120.00 16 | 1860.00 20 | 932.00 24 | 618.00 20 | 528.00 11 | 433.00 7 | 340.00 7 | 289.00 7 | 212.00 14 |
| 1983 | 1690.00 31 | 1350.00 28 | 766.00 30 | 423.00 34 | 371.00 27 | 246.00 30 | 183.00 34 | 154.00 37 | 139.00 31 |
| 1984 | 2880.00 19 | 1560.00 25 | 835.00 28 | 475.00 29 | 344.00 30 | 297.00 24 | 242.00 23 | 213.00 24 | 180.00 22 |
| 1985 | 2810.00 21 | 1760.00 21 | 943.00 23 | 560.00 24 | 383.00 25 | 354.00 17 | 277.00 18 | 268.00 9 | 214.00 13 |

ANNUAL VALUES

ANNUAL MEAN DISCHARGE AND RANKING
IN YEAR ENDING MARCH 31

| | |
|---|---|
| 1944 | 84.00 14 |
| 1945 | 105.00 22 |
| 1946 | 126.00 26 |
| 1947 | 71.00 9 |
| 1948 | 127.00 28 |
| 1949 | 153.00 36 |
| 1950 | 145.00 34 |
| 1951 | 142.00 33 |
| 1952 | 168.00 39 |
| 1953 | 81.00 13 |
| 1954 | 38.00 2 |
| 1955 | 51.00 5 |
| 1956 | 103.00 21 |
| 1957 | 80.00 12 |
| 1958 | 180.00 42 |
| 1959 | 178.00 41 |
| 1960 | 86.00 15 |

ANNUAL MEAN DISCHARGE AND RANKING
IN YEAR ENDING SEPTEMBER 30

| | |
|---|---|
| 1944 | 78.00 33 |
| 1945 | 109.00 22 |
| 1946 | 102.00 24 |
| 1947 | 120.00 17 |
| 1948 | 81.00 31 |
| 1949 | 132.00 12 |
| 1950 | 165.00 3 |
| 1951 | 153.00 5 |
| 1952 | 170.00 2 |
| 1953 | 65.00 37 |
| 1954 | 20.00 42 |
| 1955 | 59.00 39 |
| 1956 | 133.00 10 |
| 1957 | 150.00 7 |
| 1958 | 155.00 4 |
| 1959 | 118.00 18 |
| 1960 | 82.00 29 |

# APPENDIX D-1 (CONTINUED)

ANNUAL VALUES--Continued

ANNUAL MEAN DISCHARGE AND RANKING
IN YEAR ENDING MARCH 31

| | | |
|---|---|---|
| 1961 | 79.00 | 10 |
| 1962 | 126.00 | 27 |
| 1963 | 86.00 | 16 |
| 1964 | 61.00 | 7 |
| 1965 | 95.00 | 18 |
| 1966 | 69.00 | 8 |
| 1967 | 114.00 | 25 |
| 1968 | 95.00 | 19 |
| 1969 | 148.00 | 35 |
| 1970 | 107.00 | 23 |
| 1971 | 80.00 | 11 |
| 1972 | 35.00 | 1 |
| 1973 | 134.00 | 31 |
| 1974 | 130.00 | 30 |
| 1975 | 162.00 | 37 |
| 1976 | 99.00 | 20 |
| 1977 | 40.00 | 3 |
| 1978 | 94.00 | 17 |
| 1979 | 140.00 | 32 |
| 1980 | 170.00 | 40 |
| 1981 | 51.00 | 4 |
| 1982 | 165.00 | 38 |
| 1983 | 53.00 | 6 |
| 1984 | 108.00 | 24 |
| 1985 | 128.00 | 29 |

ANNUAL MEAN DISCHARGE AND RANKING
IN YEAR ENDING SEPTEMBER 30

| | | |
|---|---|---|
| 1961 | 114.00 | 19 |
| 1962 | 100.00 | 25 |
| 1963 | 70.00 | 35 |
| 1964 | 87.00 | 27 |
| 1965 | 81.00 | 30 |
| 1966 | 50.00 | 40 |
| 1967 | 129.00 | 13 |
| 1968 | 133.00 | 11 |
| 1969 | 129.00 | 14 |
| 1970 | 80.00 | 32 |
| 1971 | 68.00 | 36 |
| 1972 | 63.00 | 38 |
| 1973 | 152.00 | 6 |
| 1974 | 121.00 | 16 |
| 1975 | 141.00 | 8 |
| 1976 | 84.00 | 28 |
| 1977 | 46.00 | 41 |
| 1978 | 134.00 | 9 |
| 1979 | 176.00 | 1 |
| 1980 | 112.00 | 20 |
| 1981 | 90.00 | 26 |
| 1982 | 112.00 | 21 |
| 1983 | 76.00 | 34 |
| 1984 | 106.00 | 23 |
| 1985 | 129.00 | 15 |

NORMAL MONTHLY MEANS (ALL DAYS)

| YEAR | OCT | NOV | DEC | JAN | FEB | MARCH | APRIL | MAY | JUNE | JULY | AUG | SEPT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1943 | * | * | 103.00 | 58.90 | 148.00 | 352.00 | 57.00 | 443.00 | 118.00 | 13.70 | 15.20 | 37.10 |
| 1944 | 3.23 | 5.62 | 4.89 | 30.60 | 65.50 | 206.00 | 476.00 | 123.00 | 14.30 | 2.03 | 5.87 | 9.94 |
| 1945 | 2.83 | 6.05 | 5.26 | 15.20 | 149.00 | 456.00 | 237.00 | 94.60 | 238.00 | 17.10 | 18.40 | 69.80 |
| 1946 | 90.60 | 52.00 | 151.00 | 128.00 | 189.00 | 241.00 | 32.30 | 248.00 | 48.90 | 20.80 | 17.40 | 3.08 |
| 1947 | 5.57 | 10.60 | 71.70 | 232.00 | 68.60 | 86.70 | 285.00 | 210.00 | 404.00 | 15.30 | 45.90 | 7.92 |
| 1948 | 4.56 | 8.06 | 12.10 | 130.00 | 156.00 | 257.00 | 198.00 | 65.30 | 15.20 | 123.00 | 7.51 | 3.21 |
| 1949 | 8.48 | 108.00 | 144.00 | 676.00 | 254.00 | 229.00 | 56.60 | 33.70 | 29.90 | 23.00 | 14.00 | 14.70 |
| 1950 | 40.40 | 12.10 | 91.50 | 837.00 | 402.00 | 195.00 | 167.00 | 78.20 | 84.70 | 24.60 | 7.48 | 46.20 |
| 1951 | 8.86 | 216.00 | 204.00 | 320.00 | 340.00 | 223.00 | 184.00 | 95.70 | 87.70 | 150.00 | 11.20 | 4.27 |
| 1952 | 4.07 | 47.10 | 442.00 | 490.00 | 234.00 | 263.00 | 272.00 | 53.30 | 196.00 | 22.90 | 5.43 | 5.17 |
| 1953 | 2.94 | 5.39 | 17.60 | 78.30 | 72.20 | 249.00 | 101.00 | 186.00 | 22.00 | 38.90 | 3.54 | 2.48 |
| 1954 | 1.82 | 3.91 | 3.95 | 29.80 | 15.10 | 42.40 | 52.80 | 56.50 | 29.50 | 2.61 | 2.43 | 2.36 |
| 1955 | 3.71 | 4.31 | 21.60 | 86.30 | 117.00 | 231.00 | 75.60 | 76.00 | 30.40 | 25.10 | 4.82 | 32.80 |
| 1956 | 41.90 | 391.00 | 58.80 | 22.80 | 379.00 | 122.00 | 146.00 | 150.00 | 133.00 | 157.00 | 15.10 | 6.35 |
| 1957 | 3.76 | 7.10 | 56.50 | 81.20 | 148.00 | 64.40 | 426.00 | 437.00 | 225.00 | 305.00 | 31.40 | 10.10 |
| 1958 | 9.41 | 66.20 | 399.00 | 123.00 | 41.00 | 75.70 | 87.50 | 167.00 | 463.00 | 216.00 | 118.00 | 87.00 |
| 1959 | 35.30 | 101.00 | 67.80 | 324.00 | 286.00 | 198.00 | 131.00 | 207.00 | 43.10 | 15.60 | 7.69 | 5.62 |
| 1960 | 7.59 | 32.40 | 83.40 | 126.00 | 281.00 | 105.00 | 58.20 | 56.70 | 189.00 | 41.30 | 13.40 | 7.09 |
| 1961 | 2.82 | 6.11 | 7.24 | 17.60 | 72.60 | 475.00 | 243.00 | 475.00 | 27.20 | 14.90 | 6.24 | 7.55 |
| 1962 | 5.69 | 13.10 | 72.40 | 206.00 | 178.00 | 267.00 | 52.30 | 67.70 | 19.40 | 263.00 | 26.80 | 29.30 |
| 1963 | 7.19 | 9.01 | 7.16 | 23.10 | 15.30 | 498.00 | 113.00 | 22.80 | 24.50 | 51.50 | 55.90 | 6.16 |
| 1964 | 3.26 | 4.43 | 2.90 | 11.20 | 18.30 | 410.00 | 516.00 | 46.00 | 11.80 | 13.30 | 3.24 | 2.62 |
| 1965 | 2.69 | 6.31 | 6.45 | 71.90 | 266.00 | 221.00 | 237.00 | 47.90 | 13.30 | 48.70 | 7.24 | 64.50 |
| 1966 | 24.70 | 14.40 | 26.90 | 121.00 | 162.00 | 65.50 | 50.00 | 82.50 | 15.40 | 27.10 | 5.05 | 8.12 |
| 1967 | 8.34 | 294.00 | 415.00 | 77.70 | 135.00 | 246.00 | 96.60 | 218.00 | 34.30 | 8.15 | 4.59 | 3.27 |
| 1968 | 6.63 | 11.30 | 236.00 | 146.00 | 277.00 | 99.10 | 96.90 | 510.00 | 126.00 | 24.60 | 55.80 | 7.03 |
| 1969 | 7.44 | 78.90 | 180.00 | 446.00 | 195.00 | 40.90 | 173.00 | 35.00 | 50.00 | 304.00 | 26.40 | 16.00 |
| 1970 | 46.50 | 157.00 | 68.30 | 128.00 | 160.00 | 123.00 | 186.00 | 54.80 | 28.60 | 10.30 | 5.08 | 5.32 |
| 1971 | 8.95 | 20.00 | 41.80 | 66.10 | 441.00 | 120.00 | 28.30 | 70.10 | 37.40 | 7.42 | 3.81 | 4.14 |
| 1972 | 4.58 | 3.97 | 53.20 | 56.20 | 35.50 | 114.00 | 331.00 | 72.10 | 57.40 | 14.60 | 5.33 | 7.95 |
| 1973 | 12.90 | 277.00 | 191.00 | 150.00 | 125.00 | 365.00 | 280.00 | 45.50 | 179.00 | 145.00 | 41.60 | 10.20 |
| 1974 | 12.60 | 110.00 | 204.00 | 264.00 | 116.00 | 157.00 | 186.00 | 195.00 | 110.00 | 18.80 | 16.90 | 64.80 |
| 1975 | 35.20 | 98.30 | 183.00 | 268.00 | 428.00 | 356.00 | 169.00 | 50.50 | 80.60 | 30.10 | 7.41 | 7.29 |
| 1976 | 27.10 | 59.20 | 197.00 | 229.00 | 181.00 | 154.00 | 35.50 | 25.50 | 50.40 | 25.30 | 21.00 | 6.74 |
| 1977 | 11.30 | 8.38 | 6.52 | 3.13 | 118.00 | 172.00 | 99.20 | 69.00 | 22.20 | 24.50 | 9.87 | 8.98 |
| 1978 | 41.10 | 32.80 | 300.00 | 35.60 | 23.20 | 446.00 | 112.00 | 235.00 | 136.00 | 149.00 | 59.00 | 20.10 |
| 1979 | 17.30 | 50.30 | 118.00 | 190.00 | 237.00 | 360.00 | 252.00 | 65.40 | 58.20 | 492.00 | 231.00 | 31.50 |
| 1980 | 22.70 | 223.00 | 200.00 | 94.50 | 83.30 | 280.00 | 158.00 | 77.50 | 61.30 | 19.90 | 111.00 | 15.00 |
| 1981 | 10.10 | 12.00 | 16.50 | 9.32 | 81.90 | 45.90 | 143.00 | 512.00 | 130.00 | 45.50 | 60.00 | 10.40 |
| 1982 | 8.06 | 9.37 | 59.50 | 316.00 | 390.00 | 308.00 | 109.00 | 44.50 | 81.40 | 23.90 | 6.64 | 5.47 |
| 1983 | 4.51 | 11.20 | 156.00 | 64.10 | 73.70 | 55.30 | 235.00 | 246.00 | 38.00 | 17.70 | 8.37 | 3.75 |
| 1984 | 32.00 | 138.00 | 159.00 | 39.00 | 126.00 | 250.00 | 339.00 | 129.00 | 39.60 | 13.20 | 6.58 | 6.39 |
| 1985 | 8.40 | 60.60 | 259.00 | 119.00 | 280.00 | 293.00 | 197.00 | 123.00 | 87.30 | 20.70 | 88.00 | 21.00 |

# APPENDIX D-1 (CONTINUED)

| OCT | NOV | DEC | JAN | FEB | MARCH |
|---|---|---|---|---|---|
| | | TWENTY FIFTH PERCENTILE | | | |
| 4.40 | 7.82 | 17.60 | 39.00 | 73.70 | 114.00 |
| | | FIFTIETH PERCENTILE | | | |
| 8.37 | 17.19 | 72.40 | 119.00 | 149.00 | 223.00 |
| | | SEVENTY FIFTH PERCENTILE | | | |
| 23.19 | 99.00 | 191.00 | 229.00 | 266.00 | 293.00 |

| APRIL | MAY | JUNE | JULY | AUG | SEPT |
|---|---|---|---|---|---|
| | | TWENTY FIFTH PERCENTILE | | | |
| 87.50 | 54.80 | 28.60 | 15.30 | 5.87 | 5.32 |
| | | FIFTIETH PERCENTILE | | | |
| 158.00 | 78.20 | 50.40 | 24.50 | 11.20 | 7.92 |
| | | SEVENTY FIFTH PERCENTILE | | | |
| 237.00 | 207.00 | 126.00 | 51.50 | 31.40 | 20.10 |

# APPENDIX D-2. STATISTICAL STREAM FLOW DATA FOR SUGAR CREEK (35)

## 03362500 SUGAR CREEK NEAR EDINBURGH, IN

LOCATION.--Lat 39°21'39", long 85°59'51", in SW¼SE¼ sec.29, T.11 N., R.5 E., Johnson County, Hydrologic Unit 05120204, on left bank 50 ft upstream from highway bridge in Camp Atterbury, 1.3 mi upstream from confluence with Blue River, 1.5 mi northwest of Edinburgh, and at mile 1.3.

DRAINAGE AREA.--474 mi $^2$.

PERIOD OF RECORD.--October 1942 to September 1985. Prior to February 1943 monthly discharge only, published in WSP 1305. Prior to October 1977, published as "near Edinburg".

GAGE.--Water-stage recorder. Datum of gage is 646.23 ft above National Geodetic Vertical Datum of 1929. Prior to Oct. 1, 1952, nonrecording gage on downstream side of old highway bridge, 100 ft downstream at same datum.

AVERAGE DISCHARGE.--43 years, 490 ft $^3$/s, 14.04 in/yr.

EXTREMES FOR PERIOD OF RECORD.--Maximum discharge, 27,600 ft $^3$/s May 29, 1956, gage height, 18.38 ft; minimum daily, 9.2 ft $^3$/s Sept. 19, 1954.

DURATION TABLE OF DAILY MEAN DISCHARGES FOR YEAR ENDING SEPTEMBER 30

| CLASS | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| YEAR |  |  |  |  |  |  |  |  |  |  |  |  | NUMBER OF DAYS IN CLASS |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1944 |  |  |  |  | 31 | 20 | 17 | 50 | 64 | 34 | 15 | 11 | 10 | 3 | 7 | 6 | 10 | 12 | 20 | 12 | 9 | 10 | 5 | 5 | 2 | 4 | 1 | 2 | 2 | 2 |  | 1 | 1 |  |  |
| 1945 |  |  |  |  | 19 | 19 | 32 | 41 | 24 | 13 | 20 | 13 | 28 | 12 | 9 | 12 | 17 | 21 | 16 | 11 | 11 | 6 | 10 | 5 | 4 | 5 | 7 | 5 | 4 |  | 1 |  |  |  |  |
| 1946 |  |  |  |  | 3 | 7 | 9 | 12 | 17 | 11 | 17 | 25 | 35 | 22 | 33 | 21 | 18 | 16 | 22 | 23 | 15 | 13 | 13 | 8 | 5 | 7 | 6 | 3 | 4 |  |  |  |  |  |  |
| 1947 |  |  |  |  | 1 | 13 | 5 | 13 | 12 | 19 | 15 | 16 | 29 | 29 | 16 | 23 | 20 | 28 | 12 | 28 | 25 | 15 | 14 | 9 | 5 |  | 11 |  | 3 | 3 |  | 1 |  |  |  |
| 1948 |  |  |  |  |  |  | 1 | 18 | 21 | 29 | 61 | 43 | 36 | 14 | 20 | 20 | 10 | 12 | 12 | 12 | 10 | 11 | 4 | 7 | 5 | 5 | 4 | 6 | 4 |  | 1 |  |  |  |  |
| 1949 |  |  |  |  |  |  |  | 10 | 12 | 25 | 27 | 28 | 25 | 18 | 25 | 28 | 22 | 24 | 22 | 24 | 15 | 12 | 14 | 8 | 4 |  | 9 | 3 | 3 | 3 | 2 |  | 2 |  |  |
| 1950 |  |  |  |  |  |  |  |  | 4 | 22 | 53 | 23 | 20 | 8 | 11 | 31 | 18 | 27 | 27 | 17 | 20 | 21 | 12 | 9 | 5 | 6 | 6 | 3 | 6 | 8 | 3 | 2 | 2 | 1 |  |
| 1951 |  |  |  |  |  |  | 13 | 16 | 13 | 7 | 22 | 20 | 20 | 13 | 17 | 27 | 26 | 32 | 16 | 15 | 21 | 15 | 11 | 22 | 19 | 8 | 3 | 2 | 4 | 2 | 1 |  |  |  |  |
| 1952 |  |  |  |  |  |  | 17 | 32 | 19 | 30 | 7 | 7 | 17 | 22 | 13 | 17 | 14 | 20 | 20 | 21 | 22 | 19 | 19 | 12 | 11 | 12 | 3 | 8 | 2 |  |  | 1 |  | 1 |  |
| 1953 |  |  |  |  | 4 | 16 | 13 | 40 | 23 | 11 | 16 | 20 | 26 | 15 | 22 | 25 | 18 | 36 | 22 | 15 | 15 | 3 | 7 | 7 | 4 | 4 | 1 | 1 |  |  | 1 |  |  |  |  |
| 1954 |  | 8 | 7 | 18 | 16 | 58 | 30 | 44 | 17 | 17 | 10 | 16 | 14 | 20 | 11 | 17 | 12 | 14 | 9 | 7 | 7 | 4 | 4 | 3 |  | 2 |  |  |  |  |  |  |  |  |  |
| 1955 |  | 4 | 3 | 1 | 2 | 20 | 7 | 38 | 45 | 6 | 14 | 11 | 26 | 19 | 19 | 24 | 20 | 22 | 19 | 23 | 13 | 7 | 8 | 5 | 8 | 1 |  |  |  |  |  |  |  |  |  |
| 1956 |  |  |  |  |  |  |  | 10 | 10 | 13 | 19 | 20 | 37 | 16 | 21 | 38 | 24 | 25 | 26 | 19 | 16 | 13 | 21 | 8 | 10 | 7 | 1 | 2 | 5 | 1 | 1 | 1 |  |  | 2 |
| 1957 |  |  |  |  |  |  | 30 | 21 | 14 | 27 | 19 | 21 | 23 | 8 | 32 | 28 | 20 | 19 | 12 | 18 | 17 | 12 | 10 | 7 | 4 | 4 | 6 | 3 | 2 | 4 | 2 | 2 |  |  |  |
| 1958 |  |  |  |  |  |  |  | 4 | 11 | 6 | 10 | 7 | 19 | 29 | 46 | 46 | 27 | 34 | 16 | 19 | 18 | 7 | 15 | 10 | 11 | 6 | 6 | 4 | 11 |  | 3 |  |  |  |  |
| 1959 |  |  |  |  |  |  | 2 | 17 | 16 | 17 | 15 | 19 | 33 | 27 | 19 | 25 | 20 | 32 | 24 | 26 | 18 | 14 | 15 | 6 | 6 | 6 | 1 | 2 | 1 | 2 |  |  | 2 |  |  |
| 1960 |  |  |  |  |  |  |  |  | 14 | 41 | 16 | 36 | 22 | 36 | 39 | 35 | 26 | 27 | 14 | 18 | 11 | 7 | 7 | 4 | 4 | 1 | 3 | 2 | 1 | 2 |  |  |  |  |  |
| 1961 |  |  |  |  |  | 7 | 4 | 22 | 43 | 49 | 58 | 21 | 16 | 6 | 13 | 20 | 11 | 16 | 12 | 6 | 7 | 7 | 8 | 5 | 9 | 10 | 1 | 2 | 3 | 3 | 1 | 4 |  | 1 |  |
| 1962 |  |  |  |  |  |  | 9 | 14 | 9 | 28 | 31 | 23 | 30 | 27 | 38 | 31 | 25 | 26 | 18 | 14 | 5 | 9 | 3 | 7 | 4 | 5 | 4 |  | 4 | 1 |  |  |  |  |  |
| 1963 |  |  |  |  |  | 5 | 8 | 7 | 14 | 68 | 65 | 33 | 28 | 18 | 21 | 21 | 10 | 12 | 10 | 6 | 7 | 10 | 4 | 4 | 2 | 4 | 2 | 1 | 2 |  | 1 |  |  | 2 |  |
| 1964 |  |  |  |  | 7 | 40 | 53 | 53 | 19 | 27 | 22 | 24 | 23 | 7 | 6 | 9 | 12 | 12 | 8 | 6 | 6 | 4 | 2 | 6 | 6 | 3 | 2 | 1 | 2 |  | 2 | 2 | 2 |  |  |
| 1965 |  |  |  |  | 18 | 11 | 17 | 38 | 32 | 34 | 14 | 11 | 30 | 20 | 14 | 18 | 14 | 16 | 13 | 12 | 13 | 6 | 9 | 7 | 5 | 8 | 1 | 1 | 2 |  | 1 |  |  |  |  |
| 1966 |  |  |  |  |  | 6 | 10 | 21 | 30 | 44 | 45 | 47 | 37 | 21 | 14 | 25 | 18 | 14 | 5 | 7 | 5 | 4 | 6 | 1 | 1 | 3 | 1 |  |  |  |  |  |  |  |  |
| 1967 |  |  |  |  | 8 | 15 | 22 | 13 | 35 | 23 | 11 | 5 | 9 | 12 | 22 | 18 | 25 | 31 | 17 | 20 | 16 | 15 | 13 | 10 | 8 | 5 | 4 | 3 |  | 3 |  | 2 |  |  |  |
| 1968 |  |  |  |  | 4 | 1 | 8 | 10 | 16 | 19 | 25 | 25 | 26 | 28 | 19 | 20 | 16 | 29 | 21 | 19 | 19 | 12 | 13 | 12 | 5 | 3 | 4 | 2 | 2 | 4 | 1 | 1 |  | 2 |  |
| 1969 |  |  |  |  |  |  |  |  | 1 | 44 | 27 | 17 | 9 | 10 | 34 | 52 | 30 | 27 | 20 | 17 | 11 | 11 | 24 | 3 | 5 | 4 | 6 | 6 | 1 | 1 | 1 | 1 | 2 | 1 |  |
| 1970 |  |  |  |  |  |  |  | 2 | 21 | 25 | 22 | 26 | 22 | 25 | 37 | 29 | 30 | 33 | 18 | 16 | 15 | 11 | 12 | 5 | 6 | 3 | 4 | 2 | 1 |  |  |  |  |  |  |
| 1971 |  |  |  |  |  |  |  | 6 | 15 | 29 | 45 | 51 | 37 | 25 | 26 | 35 | 16 | 18 | 10 | 12 | 12 | 7 | 4 | 4 | 1 | 2 | 2 | 2 | 5 |  | 1 |  |  |  |  |
| 1972 |  |  |  |  |  |  |  |  | 1 | 63 | 36 | 26 | 18 | 15 | 31 | 42 | 36 | 30 | 16 | 8 | 11 | 5 | 7 | 3 | 6 | 6 | 2 | 3 | 1 |  |  |  |  |  |  |
| 1973 |  |  |  |  |  |  |  |  |  |  | 10 | 21 | 25 | 17 | 22 | 25 | 34 | 28 | 20 | 29 | 32 | 21 | 14 | 18 | 19 | 10 | 6 | 7 | 6 | 1 |  |  |  |  |  |
| 1974 |  |  |  |  |  |  |  |  |  | 14 | 33 | 28 | 27 | 10 | 20 | 25 | 26 | 33 | 27 | 25 | 19 | 21 | 13 | 9 | 9 | 8 | 4 | 6 | 7 | 1 |  |  |  |  |  |
| 1975 |  |  |  |  |  |  |  | 13 | 26 | 23 | 9 | 15 | 29 | 11 | 15 | 21 | 27 | 26 | 28 | 21 | 22 | 19 | 18 | 9 | 7 | 7 | 6 | 10 |  | 1 | 1 |  | 1 |  |  |
| 1976 |  |  |  |  |  |  |  | 19 | 15 | 25 | 44 | 34 | 30 | 23 | 19 | 26 | 16 | 27 | 14 | 16 | 13 | 11 | 8 | 9 | 5 | 5 | 4 | 3 |  |  |  |  |  |  |  |
| 1977 |  |  |  |  |  | 1 | 11 | 47 | 38 | 37 | 71 | 36 | 23 | 12 | 13 | 19 | 8 | 12 | 6 | 5 | 4 | 3 | 7 | 2 | 6 | 1 | 2 | 1 |  |  |  |  |  |  |  |
| 1978 |  |  |  |  |  |  |  |  |  |  | 4 | 29 | 12 | 47 | 41 | 41 | 30 | 25 | 20 | 26 | 19 | 16 | 13 | 5 | 8 | 9 | 5 | 8 | 1 | 2 | 3 | 1 |  |  |  |
| 1979 |  |  |  |  |  |  |  |  |  |  | 2 | 13 | 24 | 22 | 27 | 49 | 44 | 36 | 29 | 23 | 20 | 15 | 14 | 9 | 10 | 1 | 4 | 7 | 4 | 5 | 6 |  | 1 |  |  |
| 1980 |  |  |  |  |  |  |  |  |  | 2 | 15 | 15 | 35 | 27 | 43 | 46 | 27 | 25 | 18 | 20 | 19 | 16 | 17 | 13 | 10 | 5 | 5 | 7 | 1 |  |  |  |  |  |  |
| 1981 |  |  |  |  |  |  |  |  | 8 | 50 | 68 | 27 | 35 | 21 | 21 | 26 | 13 | 19 | 15 | 11 | 14 | 6 | 10 | 6 | 5 | 2 |  | 3 | 2 | 1 | 1 | 1 |  |  |  |
| 1982 |  |  |  |  |  | 2 | 14 | 14 | 16 | 43 | 42 | 21 | 15 | 19 | 25 | 18 | 14 | 15 | 14 | 18 | 11 | 20 | 11 | 3 | 6 | 3 | 9 | 4 | 4 | 1 | 3 |  |  |  |  |
| 1983 |  |  |  |  | 2 | 19 | 23 | 43 | 18 | 16 | 12 | 11 | 16 | 33 | 25 | 37 | 29 | 18 | 13 | 9 | 9 | 6 | 7 | 4 | 5 | 5 | 2 | 1 | 2 |  |  |  |  |  |  |
| 1984 |  |  |  |  |  | 3 | 5 | 10 | 20 | 24 | 18 | 20 | 17 | 25 | 20 | 23 | 19 | 29 | 28 | 23 | 17 | 14 | 18 | 12 | 6 | 5 | 5 | 2 | 2 |  | 1 |  |  |  |  |
| 1985 |  |  |  |  |  |  |  |  | 5 | 18 | 36 | 25 | 17 | 24 | 24 | 25 | 30 | 29 | 21 | 24 | 21 | 14 | 11 | 11 | 5 | 8 | 6 | 3 | 2 | 4 |  | 2 |  |  |  |

# APPENDIX D-2 (CONTINUED)

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CLASS  VALUE  TOTAL  ACCUM   PERCT        CLASS   VALUE  TOTAL  ACCUM  PERCT        CLASS   VALUE   TOTAL  ACCUM   PERCT
  0      0.0      0  15341  100.00          12    110.0   1010  10052  65.52          24    1600.0    266   1003    6.54
  1      9.2     12  15341  100.00          13    140.0    816   9042  58.94          25    2000.0    203    737    4.80
  2     12.0     10  15329   99.92          14    170.0    950   8226  53.62          26    2500.0    159    534    3.48
  3     14.0     19  15319   99.86          15    210.0   1124   7276  47.43          27    3100.0    131    375    2.44
  4     18.0    115  15300   99.73          16    270.0    882   6152  40.10          28    3900.0    106    244    1.59
  5     23.0    263  15185   98.98          17    330.0    987   5270  34.35          29    4900.0     55    138    0.90
  6     28.0    360  14922   97.27          18    420.0    730   4283  27.92          30    6100.0     38     83    0.54
  7     35.0    698  14562   94.92          19    520.0    701   3553  23.16          31    7700.0     22     45    0.29
  8     44.0    718  13864   90.37          20    650.0    610   2852  18.59          32    9600.0     13     23    0.15
  9     55.0   1033  13146   85.69          21    810.0    472   2242  14.61          33   12000.0      8     10    0.07
 10     69.0   1121  12113   78.96          22   1000.0    455   1770  11.54          34   15000.0      2      2    0.01
 11     87.0    940  10992   71.65          23   1300.0    312   1315   8.57


VALUE EXCEEDED 'P' PERCENT OF TIME
P95 •      34.8
P90 •      44.9
P75 •      78.7
P70 •      93.2
P50 •     193.0
P25 •     481.0
P10 •    1160.0


            LOWEST MEAN DISCHARGE AND RANKING FOR THE FOLLOWING NUMBER OF CONSECUTIVE DAYS IN YEAR ENDING MARCH 31

YEAR        1           3           7          14          30          60          90         120         183
1944    30.00 15    31.00 15    35.00 17    38.00 18    40.00 16    45.00 16    50.00 14    52.00 10    62.00  7
1945    18.00  4    18.00  3    19.00  3    20.00  2    22.00  3    23.00  2    28.00  4    29.00  2    32.00  1

1946    51.00 33    51.00 32    53.00 30    54.00 29    60.00 29   109.00 37   119.00 36   235.00 38   240.00 32
1947    20.00  6    21.00  6    23.00  6    25.00  9    27.00  8    31.00  7    38.00  7    48.00  8    89.00 13
1948    47.00 27    50.00 28    55.00 32    57.00 30    64.00 34    74.00 31    80.00 28    91.00 27   152.00 27
1949    34.00 19    35.00 18    37.00 18    41.00 20    42.00 19    45.00 17    57.00 19   126.00 32   155.00 28
1950    47.00 28    50.00 29    51.00 27    53.00 27    63.00 31    88.00 34   102.00 34   113.00 30   133.00 24

1951    55.00 35    58.00 36    63.00 37    65.00 36    72.00 36   100.00 36   157.00 38   148.00 33   286.00 35
1952    28.00 14    30.00 14    30.00 14    31.00 13    34.00 11    36.00 11    41.00  8    61.00 16   157.00 29
1953    32.00 16    35.00 19    37.00 19    39.00 19    40.00 17    44.00 15    52.00 15    53.00 11    85.00 11
1954    17.00  2    18.00  4    19.00  4    22.00  5    23.00  4    25.00  4    27.00  3    33.00  5    45.00  4
1955     9.20  1     9.60  1    10.00  1    12.00  1    12.00  1    18.00  1    20.00  1    28.00  1    34.00  2

1956    23.00  8    23.00  7    24.00  7    25.00  6    29.00  9    52.00 20   110.00 35   165.00 36   246.00 33
1957    32.00 17    32.00 16    33.00 15    34.00 15    34.00 12    35.00  8    41.00  9    49.00  9    81.00 10
1958    42.00 26    43.00 26    44.00 25    45.00 23    57.00 25    65.00 24    75.00 25   102.00 28   343.00 39
1959   106.00 41   109.00 41   122.00 41   141.00 42   148.00 42   188.00 42   295.00 42   302.00 40   504.00 41
1960    33.00 18    35.00 17    35.00 16    36.00 16    42.00 18    52.00 21    62.00 20    71.00 20   102.00 19

1961    36.00 21    38.00 22    40.00 22    43.00 21    44.00 20    49.00 18    54.00 17    58.00 14    71.00  9
1962    26.00 12    26.00 11    26.00 11    30.00 11    39.00 15    41.00 14    47.00 13    59.00 15    88.00 12
1963    48.00 29    49.00 27    53.00 28    57.00 31    59.00 28    74.00 32    79.00 26    77.00 21    93.00 17
1964    23.00  9    24.00  9    25.00  9    25.00  7    26.00  7    29.00  6    31.00  5    32.00  3    45.00  3
1965    18.00  3    18.00  2    19.00  2    21.00  3    22.00  2    24.00  3    27.00  2    32.00  4    62.00  5

1966    35.00 20    36.00 20    37.00 20    38.00 17    44.00 21    64.00 23    80.00 27    82.00 25    92.00 16
1967    24.00 10    25.00 10    26.00 10    29.00 10    34.00 13    40.00 12    46.00 12    54.00 12    90.00 14
1968    19.00  5    20.00  5    21.00  5    22.00  4    23.00  5    28.00  5    33.00  6    39.00  6    65.00  8
1969    55.00 36    58.00 37    60.00 34    61.00 34    62.00 30    68.00 27    94.00 31   178.00 37   246.00 34
1970    50.00 31    56.00 34    60.00 35    70.00 37    88.00 39   112.00 38   171.00 39   284.00 39   320.00 37

1971    40.00 25    41.00 23    42.00 23    46.00 24    50.00 23    57.00 22    67.00 21    78.00 22    91.00 15
1972    50.00 32    51.00 30    54.00 31    54.00 28    58.00 26    66.00 25    68.00 22    68.00 19   108.00 20
1973    58.00 38    58.00 38    60.00 36    65.00 35    70.00 35    80.00 33   101.00 33   118.00 31   202.00 31
1974    66.00 39    66.00 39    66.00 38    70.00 38    83.00 38    89.00 35    97.00 32   151.00 34   330.00 38
1975    55.00 37    57.00 35    66.00 39    78.00 39    80.00 37   135.00 39   156.00 37   154.00 35   294.00 36

1976    39.00 23    41.00 24    42.00 24    44.00 22    48.00 22    50.00 19    57.00 18    67.00 18   118.00 21
1977    27.00 13    28.00 13    30.00 12    33.00 14    36.00 14    41.00 13    53.00 16    62.00 17    62.00  6
1978    37.00 22    38.00 21    40.00 21    47.00 25    64.00 32    68.00 28    73.00 24    80.00 23   120.00 22
1979    85.00 40    86.00 40    89.00 40    93.00 40   117.00 40   143.00 40   208.00 40   317.00 41   436.00 40
1980   120.00 42   122.00 42   123.00 42   127.00 41   134.00 41   168.00 41   266.00 41   478.00 42   512.00 42

1981    53.00 34    54.00 33    57.00 33    60.00 33    64.00 33    67.00 26    83.00 29    83.00 26   141.00 26
1982    49.00 30    51.00 31    53.00 29    57.00 32    59.00 27    69.00 29    71.00 23    80.00 24   137.00 25
1983    25.00 11    27.00 12    30.00 13    31.00 12    33.00 10    35.00  9    43.00 11    48.00  7    94.00 18
1984    22.00  7    23.00  8    24.00  8    25.00  8    26.00  6    35.00 10    41.00 10    57.00 13   123.00 23
1985    40.00 24    41.00 25    45.00 26    48.00 26    51.00 24    74.00 30    91.00 30   110.00 29   182.00 30
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# APPENDIX D-2 (CONTINUED)

HIGHEST MEAN DISCHARGE AND RANKING FOR THE FOLLOWING NUMBER OF CONSECUTIVE DAYS IN YEAR ENDING SEPTEMBER 30

| YEAR | 1 | 3 | 7 | 15 | 30 | 60 | 90 | 120 | 183 |
|---|---|---|---|---|---|---|---|---|---|
| 1944 | 10600.00 10 | 8150.00 10 | 5650.00 5 | 3180.00 12 | 2130.00 13 | 1540.00 14 | 1210.00 17 | 961.00 25 | 659.00 29 |
| 1945 | 6310.00 26 | 4420.00 30 | 3250.00 27 | 2320.00 26 | 1760.00 24 | 1410.00 19 | 1110.00 23 | 1030.00 20 | 760.00 24 |
| 1946 | 4480.00 34 | 3970.00 33 | 3410.00 24 | 1990.00 28 | 1330.00 34 | 1030.00 33 | 1020.00 28 | 835.00 31 | 775.00 23 |
| 1947 | 9230.00 14 | 6580.00 18 | 4570.00 16 | 2720.00 20 | 1700.00 26 | 1500.00 16 | 1250.00 13 | 1010.00 21 | 914.00 16 |
| 1948 | 6170.00 27 | 4690.00 27 | 3800.00 23 | 2480.00 24 | 2190.00 10 | 1370.00 21 | 1120.00 21 | 981.00 23 | 728.00 26 |
| 1949 | 10200.00 12 | 8280.00 9 | 4720.00 15 | 3140.00 13 | 2860.00 3 | 2060.00 3 | 1740.00 3 | 1450.00 3 | 1070.00 6 |
| 1950 | 12700.00 6 | 9520.00 5 | 6280.00 2 | 5610.00 1 | 4140.00 1 | 3110.00 1 | 2410.00 1 | 2020.00 1 | 1520.00 1 |
| 1951 | 7680.00 20 | 5520.00 22 | 3380.00 25 | 2470.00 25 | 1540.00 28 | 1370.00 22 | 1240.00 14 | 1160.00 12 | 1050.00 7 |
| 1952 | 12500.00 7 | 8100.00 11 | 4310.00 18 | 3260.00 11 | 1990.00 17 | 1530.00 15 | 1430.00 7 | 1310.00 6 | 1090.00 5 |
| 1953 | 6900.00 23 | 4450.00 29 | 2530.00 35 | 1610.00 36 | 1160.00 37 | 797.00 37 | 791.00 35 | 674.00 36 | 577.00 36 |
| 1954 | 2190.00 41 | 1870.00 41 | 1280.00 42 | 1020.00 41 | 786.00 41 | 561.00 41 | 453.00 41 | 403.00 41 | 291.00 42 |
| 1955 | 2010.00 42 | 1770.00 42 | 1650.00 40 | 1180.00 40 | 977.00 39 | 778.00 38 | 645.00 39 | 593.00 39 | 493.00 39 |
| 1956 | 19200.00 1 | 11100.00 1 | 5930.00 4 | 2990.00 16 | 1740.00 25 | 1190.00 28 | 959.00 31 | 1090.00 16 | 861.00 19 |
| 1957 | 8960.00 15 | 6920.00 16 | 4870.00 14 | 3020.00 14 | 1830.00 20 | 1720.00 8 | 1460.00 6 | 1320.00 5 | 1020.00 10 |
| 1958 | 6900.00 24 | 6130.00 20 | 4050.00 22 | 3000.00 15 | 1800.00 22 | 1740.00 7 | 1330.00 10 | 1170.00 9 | 888.00 17 |
| 1959 | 10800.00 9 | 8850.00 8 | 5100.00 11 | 2780.00 17 | 2330.00 7 | 1600.00 12 | 1240.00 15 | 1100.00 15 | 868.00 18 |
| 1960 | 5470.00 30 | 4080.00 32 | 3020.00 31 | 1810.00 32 | 1190.00 36 | 778.00 39 | 681.00 38 | 611.00 38 | 568.00 37 |
| 1961 | 14600.00 2 | 10800.00 3 | 6140.00 3 | 4230.00 2 | 2960.00 2 | 2120.00 2 | 1930.00 2 | 1530.00 2 | 1050.00 8 |
| 1962 | 4980.00 32 | 3810.00 34 | 2330.00 36 | 1720.00 34 | 1590.00 27 | 1080.00 31 | 979.00 30 | 805.00 32 | 617.00 33 |
| 1963 | 13500.00 4 | 10700.00 4 | 5530.00 7 | 3310.00 8 | 2520.00 4 | 1560.00 13 | 1120.00 22 | 882.00 28 | 634.00 30 |
| 1964 | 10900.00 8 | 8900.00 7 | 5630.00 6 | 3260.00 9 | 2120.00 14 | 1920.00 5 | 1360.00 8 | 1040.00 19 | 729.00 25 |
| 1965 | 6760.00 25 | 5240.00 24 | 3040.00 30 | 1730.00 33 | 1460.00 29 | 1080.00 32 | 1070.00 26 | 887.00 27 | 632.00 31 |
| 1966 | 2900.00 40 | 2250.00 40 | 1540.00 41 | 962.00 42 | 675.00 42 | 531.00 42 | 453.00 42 | 395.00 42 | 336.00 41 |
| 1967 | 8770.00 17 | 7730.00 13 | 5340.00 8 | 3260.00 10 | 2120.00 15 | 1280.00 26 | 1060.00 27 | 1010.00 22 | 930.00 15 |
| 1968 | 13900.00 3 | 11000.00 2 | 6740.00 1 | 3880.00 4 | 2290.00 8 | 1370.00 23 | 1170.00 19 | 1130.00 14 | 992.00 12 |
| 1969 | 12800.00 5 | 9230.00 6 | 4910.00 13 | 3440.00 6 | 2500.00 5 | 1640.00 11 | 1260.00 12 | 1050.00 18 | 844.00 21 |
| 1970 | 3990.00 36 | 3130.00 37 | 2290.00 37 | 1550.00 38 | 1080.00 38 | 822.00 36 | 824.00 34 | 744.00 34 | 668.00 28 |
| 1971 | 6110.00 28 | 5120.00 25 | 4180.00 21 | 2770.00 18 | 1940.00 18 | 1240.00 27 | 937.00 32 | 767.00 33 | 599.00 34 |
| 1972 | 4350.00 35 | 3370.00 36 | 2570.00 34 | 1970.00 29 | 1390.00 31 | 968.00 35 | 780.00 36 | 680.00 35 | 591.00 35 |
| 1973 | 5840.00 29 | 4720.00 26 | 2880.00 32 | 2140.00 27 | 1900.00 19 | 1460.00 17 | 1180.00 18 | 1070.00 17 | 1100.00 3 |
| 1974 | 5010.00 31 | 4610.00 28 | 3320.00 26 | 2500.00 23 | 1780.00 23 | 1330.00 24 | 1160.00 20 | 1140.00 13 | 1020.00 9 |
| 1975 | 10000.00 13 | 7400.00 14 | 4300.00 19 | 2570.00 21 | 2010.00 16 | 1700.00 9 | 1530.00 4 | 1370.00 4 | 1100.00 4 |
| 1976 | 3630.00 38 | 2890.00 38 | 2160.00 38 | 1590.00 37 | 1290.00 35 | 1100.00 29 | 997.00 29 | 871.00 29 | 625.00 32 |
| 1977 | 3130.00 39 | 2400.00 39 | 1940.00 39 | 1450.00 39 | 893.00 40 | 753.00 40 | 634.00 40 | 505.00 40 | 362.00 40 |
| 1978 | 8150.00 18 | 7140.00 15 | 4990.00 12 | 3620.00 5 | 2190.00 11 | 1390.00 20 | 1210.00 16 | 1170.00 10 | 940.00 14 |
| 1979 | 10300.00 11 | 7770.00 12 | 5230.00 9 | 4120.00 3 | 2380.00 6 | 1750.00 6 | 1280.00 11 | 1160.00 11 | 1130.00 2 |
| 1980 | 3960.00 37 | 3530.00 35 | 3150.00 28 | 1910.00 31 | 1400.00 30 | 1100.00 30 | 859.00 33 | 844.00 30 | 808.00 22 |
| 1981 | 7750.00 19 | 6560.00 19 | 5180.00 10 | 3320.00 7 | 2130.00 12 | 1430.00 18 | 1080.00 25 | 889.00 26 | 690.00 27 |
| 1982 | 7200.00 21 | 5680.00 21 | 4320.00 17 | 2760.00 19 | 2260.00 9 | 1940.00 4 | 1530.00 5 | 1300.00 7 | 968.00 13 |
| 1983 | 4580.00 33 | 4090.00 31 | 2810.00 33 | 1660.00 35 | 1380.00 32 | 979.00 34 | 744.00 37 | 640.00 37 | 567.00 38 |
| 1984 | 7100.00 22 | 5260.00 23 | 3150.00 29 | 1950.00 30 | 1360.00 33 | 1310.00 25 | 1100.00 24 | 967.00 24 | 845.00 20 |
| 1985 | 8880.00 16 | 6710.00 17 | 4200.00 20 | 2520.00 22 | 1810.00 21 | 1650.00 10 | 1340.00 9 | 1220.00 8 | 1000.00 11 |

ANNUAL VALUES

ANNUAL MEAN DISCHARGE AND RANKING
IN YEAR ENDING MARCH 31

| | |
|---|---|
| 1944 | 362.00 12 |
| 1945 | 405.00 17 |
| 1946 | 576.00 26 |
| 1947 | 341.00 9 |
| 1948 | 593.00 29 |
| 1949 | 689.00 35 |
| 1950 | 734.00 39 |
| 1951 | 661.00 32 |
| 1952 | 617.00 30 |
| 1953 | 374.00 13 |
| 1954 | 225.00 2 |
| 1955 | 257.00 5 |
| 1956 | 521.00 24 |
| 1957 | 376.00 14 |
| 1958 | 698.00 36 |
| 1959 | 808.00 42 |
| 1960 | 361.00 11 |

ANNUAL MEAN DISCHARGE AND RANKING
IN YEAR ENDING SEPTEMBER 30

| | |
|---|---|
| 1944 | 350.00 35 |
| 1945 | 423.00 24 |
| 1946 | 482.00 23 |
| 1947 | 539.00 18 |
| 1948 | 422.00 25 |
| 1949 | 605.00 13 |
| 1950 | 849.00 1 |
| 1951 | 627.00 9 |
| 1952 | 644.00 7 |
| 1953 | 332.00 37 |
| 1954 | 160.00 42 |
| 1955 | 292.00 39 |
| 1956 | 662.00 5 |
| 1957 | 555.00 17 |
| 1958 | 688.00 4 |
| 1959 | 521.00 21 |
| 1960 | 365.00 31 |

# APPENDIX D-2 (CONTINUED)

ANNUAL VALUES--Continued

ANNUAL MEAN DISCHARGE AND RANKING
IN YEAR ENDING MARCH 31

| | | |
|---|---|---|
| 1961 | 394.00 | 15 |
| 1962 | 585.00 | 27 |
| 1963 | 347.00 | 10 |
| 1964 | 288.00 | 6 |
| 1965 | 422.00 | 18 |
| 1966 | 291.00 | 7 |
| 1967 | 446.00 | 21 |
| 1968 | 422.00 | 19 |
| 1969 | 686.00 | 34 |
| 1970 | 540.00 | 25 |
| 1971 | 401.00 | 16 |
| 1972 | 246.00 | 4 |
| 1973 | 661.00 | 31 |
| 1974 | 668.00 | 33 |
| 1975 | 747.00 | 41 |
| 1976 | 447.00 | 22 |
| 1977 | 198.00 | 1 |
| 1978 | 436.00 | 20 |
| 1979 | 704.00 | 37 |
| 1980 | 742.00 | 40 |
| 1981 | 299.00 | 8 |
| 1982 | 720.00 | 38 |
| 1983 | 245.00 | 3 |
| 1984 | 492.00 | 23 |
| 1985 | 593.00 | 28 |

ANNUAL MEAN DISCHARGE AND RANKING
IN YEAR ENDING SEPTEMBER 30

| | | |
|---|---|---|
| 1961 | 558.00 | 16 |
| 1962 | 387.00 | 28 |
| 1963 | 358.00 | 33 |
| 1964 | 383.00 | 30 |
| 1965 | 353.00 | 34 |
| 1966 | 203.00 | 41 |
| 1967 | 525.00 | 19 |
| 1968 | 605.00 | 14 |
| 1969 | 626.00 | 10 |
| 1970 | 404.00 | 26 |
| 1971 | 349.00 | 36 |
| 1972 | 363.00 | 32 |
| 1973 | 762.00 | 3 |
| 1974 | 630.00 | 8 |
| 1975 | 626.00 | 11 |
| 1976 | 386.00 | 29 |
| 1977 | 213.00 | 40 |
| 1978 | 660.00 | 6 |
| 1979 | 785.00 | 2 |
| 1980 | 561.00 | 15 |
| 1981 | 390.00 | 27 |
| 1982 | 525.00 | 20 |
| 1983 | 320.00 | 38 |
| 1984 | 506.00 | 22 |
| 1985 | 613.00 | 12 |

NORMAL MONTHLY MEANS (ALL DAYS)

| YEAR | OCT | NOV | DEC | JAN | FEB | MARCH | APRIL | MAY | JUNE | JULY | AUG | SEPT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1943 | * | * | * | * | * | * | 269.00 | 1698.0 | 520.00 | 164.00 | 97.40 | 72.10 |
| 1944 | 40.70 | 58.70 | 49.70 | 105.00 | 254.00 | 995.00 | 2060.0 | 442.00 | 119.00 | 34.70 | 33.10 | 29.50 |
| 1945 | 22.20 | 36.50 | 37.10 | 62.00 | 412.00 | 1593.0 | 1143.0 | 434.00 | 854.00 | 123.00 | 146.00 | 232.00 |
| 1946 | 448.00 | 248.00 | 558.00 | 697.00 | 798.00 | 1260.0 | 195.00 | 1030.0 | 317.00 | 116.00 | 76.30 | 31.50 |
| 1947 | 31.50 | 56.60 | 268.00 | 987.00 | 472.00 | 498.00 | 1213.0 | 828.00 | 1464.0 | 257.00 | 281.00 | 124.00 |
| 1948 | 67.90 | 85.80 | 92.90 | 701.00 | 579.00 | 1433.0 | 1167.0 | 359.00 | 132.00 | 336.00 | 69.30 | 44.40 |
| 1949 | 61.00 | 434.00 | 572.00 | 2782.0 | 1158.0 | 1163.0 | 313.00 | 197.00 | 223.00 | 149.00 | 126.00 | 89.80 |
| 1950 | 154.00 | 83.20 | 354.00 | 4000.0 | 2192.0 | 993.00 | 753.00 | 405.00 | 772.00 | 200.00 | 75.20 | 292.00 |
| 1951 | 103.00 | 818.00 | 912.00 | 1232.0 | 1500.0 | 949.00 | 885.00 | 408.00 | 280.00 | 400.00 | 66.80 | 37.80 |
| 1952 | 34.70 | 194.00 | 1343.0 | 1529.0 | 1123.0 | 1102.0 | 1192.0 | 266.00 | 645.00 | 187.00 | 51.10 | 73.30 |
| 1953 | 41.10 | 52.60 | 177.00 | 371.00 | 329.00 | 1119.0 | 433.00 | 771.00 | 148.00 | 406.00 | 82.50 | 26.10 |
| 1954 | 24.40 | 33.40 | 49.10 | 182.00 | 182.00 | 350.00 | 700.00 | 248.00 | 93.90 | 29.50 | 25.40 | 13.40 |
| 1955 | 46.80 | 40.20 | 104.00 | 430.00 | 431.00 | 931.00 | 544.00 | 264.00 | 325.00 | 210.00 | 53.90 | 133.00 |
| 1956 | 500.00 | 1720.0 | 328.00 | 122.00 | 1556.0 | 589.00 | 763.00 | 1372.0 | 480.00 | 453.00 | 79.80 | 52.00 |
| 1957 | 34.10 | 42.20 | 153.00 | 318.00 | 505.00 | 265.00 | 1825.0 | 1530.0 | 973.00 | 843.00 | 116.00 | 70.10 |
| 1958 | 67.90 | 252.00 | 1689.0 | 496.00 | 205.00 | 270.00 | 285.00 | 696.00 | 1608.0 | 1216.0 | 1046.0 | 371.00 |
| 1959 | 168.00 | 447.00 | 314.00 | 1478.0 | 1316.0 | 787.00 | 583.00 | 749.00 | 247.00 | 101.00 | 64.60 | 46.20 |
| 1960 | 80.70 | 177.00 | 336.00 | 484.00 | 1077.0 | 417.00 | 303.00 | 313.00 | 685.00 | 386.00 | 87.90 | 70.30 |
| 1961 | 45.30 | 55.80 | 63.80 | 112.00 | 305.00 | 2281.0 | 1524.0 | 1769.0 | 260.00 | 109.00 | 85.90 | 42.50 |
| 1962 | 40.40 | 88.90 | 228.00 | 932.00 | 682.00 | 1249.0 | 270.00 | 290.00 | 128.00 | 512.00 | 97.30 | 121.00 |
| 1963 | 88.10 | 89.60 | 59.70 | 118.00 | 93.30 | 2245.0 | 781.00 | 241.00 | 179.00 | 178.00 | 151.00 | 39.20 |
| 1964 | 27.50 | 37.10 | 30.40 | 60.70 | 74.80 | 1642.0 | 2076.0 | 300.00 | 95.80 | 188.00 | 43.90 | 25.90 |
| 1965 | 22.40 | 37.20 | 49.60 | 352.00 | 1031.0 | 912.00 | 1230.0 | 255.00 | 82.50 | 156.00 | 47.20 | 129.00 |
| 1966 | 79.10 | 75.20 | 103.00 | 478.00 | 589.00 | 302.00 | 221.00 | 339.00 | 85.50 | 96.50 | 43.40 | 42.60 |
| 1967 | 55.10 | 739.00 | 1716.0 | 385.00 | 568.00 | 1048.0 | 509.00 | 965.00 | 179.00 | 63.60 | 36.20 | 24.50 |
| 1968 | 40.40 | 59.20 | 944.00 | 530.00 | 1335.0 | 409.00 | 702.00 | 1971.0 | 620.00 | 142.00 | 441.00 | 83.40 |
| 1969 | 64.10 | 331.00 | 777.00 | 1703.0 | 1195.0 | 220.00 | 777.00 | 258.00 | 387.00 | 1503.0 | 222.00 | 101.00 |
| 1970 | 243.00 | 734.00 | 352.00 | 536.00 | 798.00 | 593.00 | 906.00 | 339.00 | 141.00 | 108.00 | 89.10 | 54.70 |
| 1971 | 74.80 | 108.00 | 226.00 | 336.00 | 1937.0 | 625.00 | 170.00 | 303.00 | 303.00 | 103.00 | 61.60 | 74.00 |
| 1972 | 72.10 | 66.00 | 554.00 | 427.00 | 235.00 | 573.00 | 1360.0 | 369.00 | 378.00 | 132.00 | 81.20 | 112.00 |
| 1973 | 153.00 | 1518.0 | 924.00 | 700.00 | 620.00 | 1606.0 | 1261.0 | 277.00 | 1080.0 | 688.00 | 243.00 | 94.00 |
| 1974 | 83.60 | 441.00 | 968.00 | 1453.0 | 631.00 | 800.00 | 974.00 | 829.00 | 865.00 | 175.00 | 107.00 | 231.00 |
| 1975 | 135.00 | 357.00 | 768.00 | 1240.0 | 1910.0 | 1462.0 | 889.00 | 323.00 | 302.00 | 115.00 | 54.90 | 50.00 |
| 1976 | 80.70 | 126.00 | 639.00 | 1040.0 | 1070.0 | 705.00 | 177.00 | 120.00 | 191.00 | 323.00 | 122.00 | 46.50 |
| 1977 | 65.50 | 88.50 | 58.10 | 36.50 | 441.00 | 720.00 | 498.00 | 339.00 | 84.10 | 103.00 | 68.30 | 67.10 |
| 1978 | 283.00 | 160.00 | 1277.0 | 221.00 | 155.00 | 1920.0 | 633.00 | 926.00 | 747.00 | 594.00 | 661.00 | 262.00 |
| 1979 | 165.00 | 292.00 | 635.00 | 851.00 | 1108.0 | 1588.0 | 1080.0 | 277.00 | 280.00 | 1564.0 | 1348.0 | 217.00 |
| 1980 | 144.00 | 972.00 | 897.00 | 467.00 | 403.00 | 1220.0 | 786.00 | 413.00 | 482.00 | 138.00 | 692.00 | 113.00 |
| 1981 | 68.70 | 73.90 | 112.00 | 77.50 | 445.00 | 215.00 | 526.00 | 2011.0 | 595.00 | 271.00 | 178.00 | 99.00 |
| 1982 | 71.30 | 74.50 | 271.00 | 1090.0 | 2028.0 | 1499.0 | 502.00 | 244.00 | 396.00 | 127.00 | 63.30 | 39.40 |
| 1983 | 34.60 | 68.90 | 572.00 | 286.00 | 355.00 | 261.00 | 904.00 | 1018.0 | 162.00 | 107.00 | 48.50 | 27.10 |
| 1984 | 85.90 | 538.00 | 870.00 | 216.00 | 708.00 | 1227.0 | 1338.0 | 563.00 | 202.00 | 168.00 | 103.00 | 68.60 |
| 1985 | 100.00 | 517.00 | 1034.0 | 637.00 | 1356.0 | 1097.0 | 1223.0 | 648.00 | 373.00 | 107.00 | 245.00 | 78.10 |

# APPENDIX D-2 (CONTINUED)

| | OCT | NOV | DEC | JAN | FEB | MARCH |
|---|---|---|---|---|---|---|
| TWENTY FIFTH PERCENTILE | 40.60 | 59.10 | 104.00 | 220.00 | 391.00 | 554.00 |
| FIFTIETH PERCENTILE | 70.00 | 98.80 | 344.00 | 481.00 | 626.00 | 971.00 |
| SEVENTY FIFTH PERCENTILE | 111.00 | 436.00 | 877.00 | 1000.00 | 1167.00 | 1303.00 |

| | APRIL | MAY | JUNE | JULY | AUG | SEPT |
|---|---|---|---|---|---|---|
| TWENTY FIFTH PERCENTILE | 498.00 | 277.00 | 162.00 | 109.00 | 61.60 | 42.50 |
| FIFTIETH PERCENTILE | 777.00 | 405.00 | 303.00 | 168.00 | 85.90 | 70.30 |
| SEVENTY FIFTH PERCENTILE | 1192.00 | 829.00 | 620.00 | 386.00 | 151.00 | 113.00 |

# APPENDIX E

# CORRELATIONS BETWEEN SOIL PROPERTIES AND INDEX PARAMETERS (36)

## Effective Preconsolidation Stress in Cohesive Soils

Correlation with Index Parameters

(I) Stas and Kulhawy[1]:

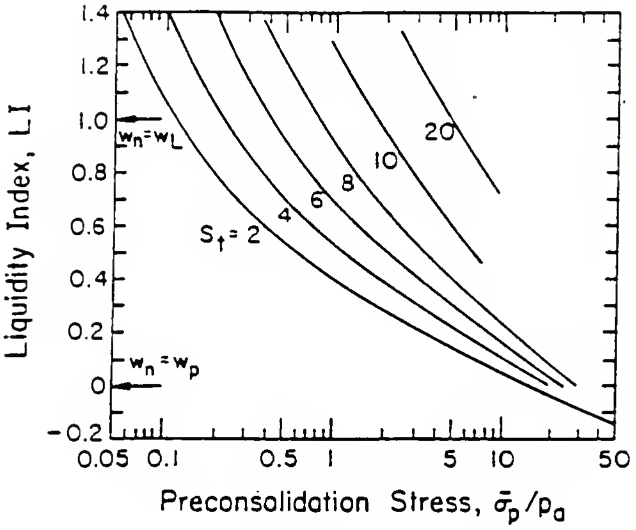
$$\frac{\overline{\sigma_p}}{P_a} = 10^{(1.11-1.62LI)}$$

where $\overline{\sigma_p}$ = largest preconsolidation stress

$P_a$ = atmospheric stress in the desired stress units

LI = liquidity index

(II) NAVFAC[2]:



where $S_t$ = sensitivity

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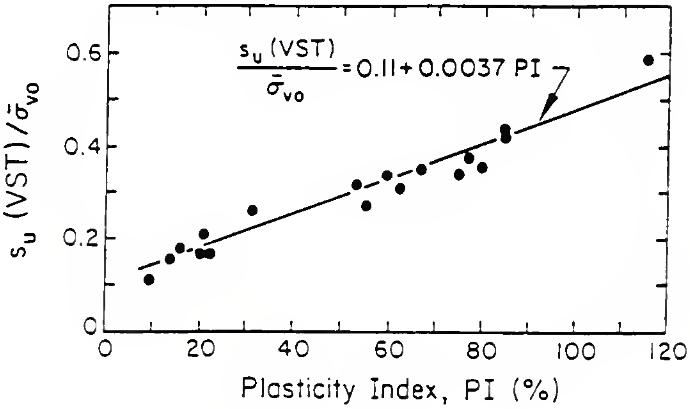
[1] Stas, C. V., and Kulhawy, F. H. "Critical Evaluation of Design Methods for Foundations Under Axial Uplift and Compression Loading," Report EL-3771, Electric Power Research Institute, Palo Alto, 1984, 198p.

[2] NAVFAC, Soil Mechanics (DM7.1) Naval Facilities Engineering Command, Alexandria, 1982, 355p.

## Undrained Shear Strength of Cohesive Soils

### Correlation with Index Parameters for Undisturbed Clays

(I) Skempton[1]:



where $S_u$ = undrained shear strength

VST = vane shear test

$\overline{\sigma_{vo}}$ = effective vertical stress

Note:

(1) for NC clay only

(2) The value of $S_u$ determined from the VST should not be used directly in analysis, because it needs to be corrected for the strain rate during testing and the soil anisotropy.

(II) Jamiolkowski et al[2]:

for low OCR clays with low to moderate PI

$$\frac{S_u}{\overline{\sigma_p}} = 0.23 \pm 0.04$$

where $\overline{\sigma_p}$ = preconsolidation stress

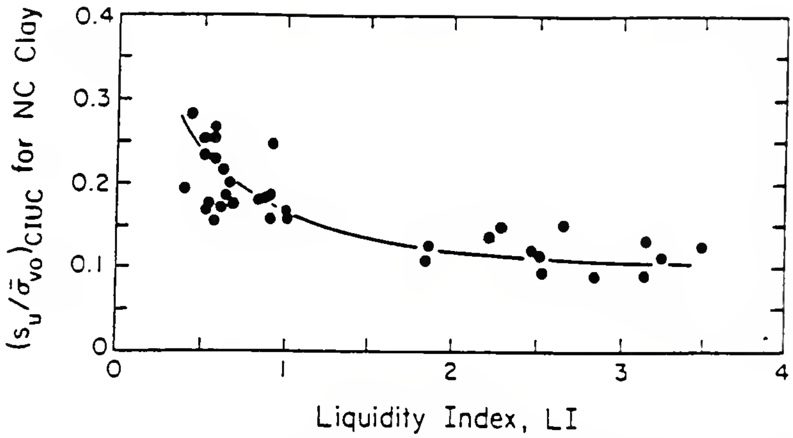
$S_u$ corresponds to direct simple shear conditions

---

[1] Skempton, A. W. "Discussion of Planning and Design of New Hong Kong Airport," Proceedings, Institution of Civil Engineers, Vol. 7, June 1957, pp. 305-307.

[2] Jamiolkowski, M., Ladd, C. C., Germaine, J. T., and Lancellotta, R. "New Developments in Field and Laboratory Testing of Soils," Proceedings, 11th International Conference on Soil Mechanics and Foundation Engineering, Vol. 1, San Francisco, 1985, pp. 57-153.

(III) Bjerrum and Simons[3]:



where CIUC = consolidated isotropic undrained triaxial compression

(IV) Mesri[4]:

$$\frac{S_u}{\sigma_p} = 0.22$$

$S_u$ corresponds to direct simple shear conditions

---

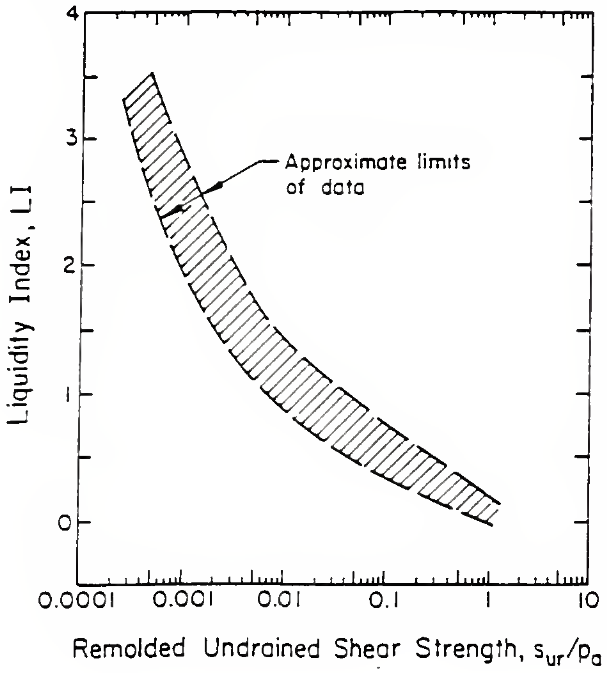
[3] Bjerrum, L., and Simons, N. E. "Comparison of Shear Strength Characteristics of Normally Consolidated Clays," ASCE Research Conference on Shear Strength of Cohesive Soils, Boulder, 1960, pp. 711-726.

[4] Mesri, G. " A Re-evaluation of $S_u(\text{mob}) = 0.22\sigma_p'$ using Laboratory Shear Tests," Canadian Geotechnical Journal, Vol. 26, No. 1, Feb. 1989, pp. 162-164.

## Undrained Shear Strength of Cohesive Soils

Correlation with Index Parameters for Remolded Clays

(I) Mitchell[1]:



where $S_{ur}$ = remolded undrained shear strength

$P_a$ = atmospheric pressure or stress

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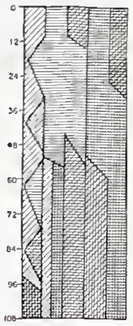
[1] Mitchell, J. K. Fundamentals of Soil Behavior, John Wiley and Sons, New York, 1976, p228.

JHRP-92/10

# GENERAL SOIL PROFILES

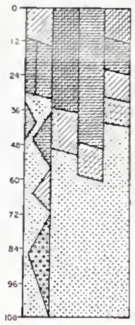
## GLACIAL DRIFT

GLACIAL TILL



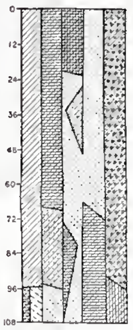
## GLACIAL-FLUVIAL DRIFT

OUTWASH PLAINS AND TERRACES



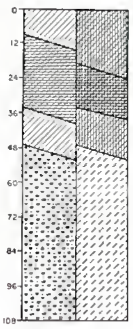
## FLUVIAL DRIFT

FLOOD PLAINS

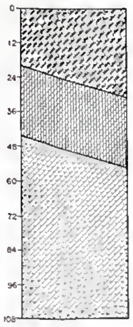


## RESIDUAL SOILS

SANDSTONE, SILTSTONE AND SHALE RESIDUUM

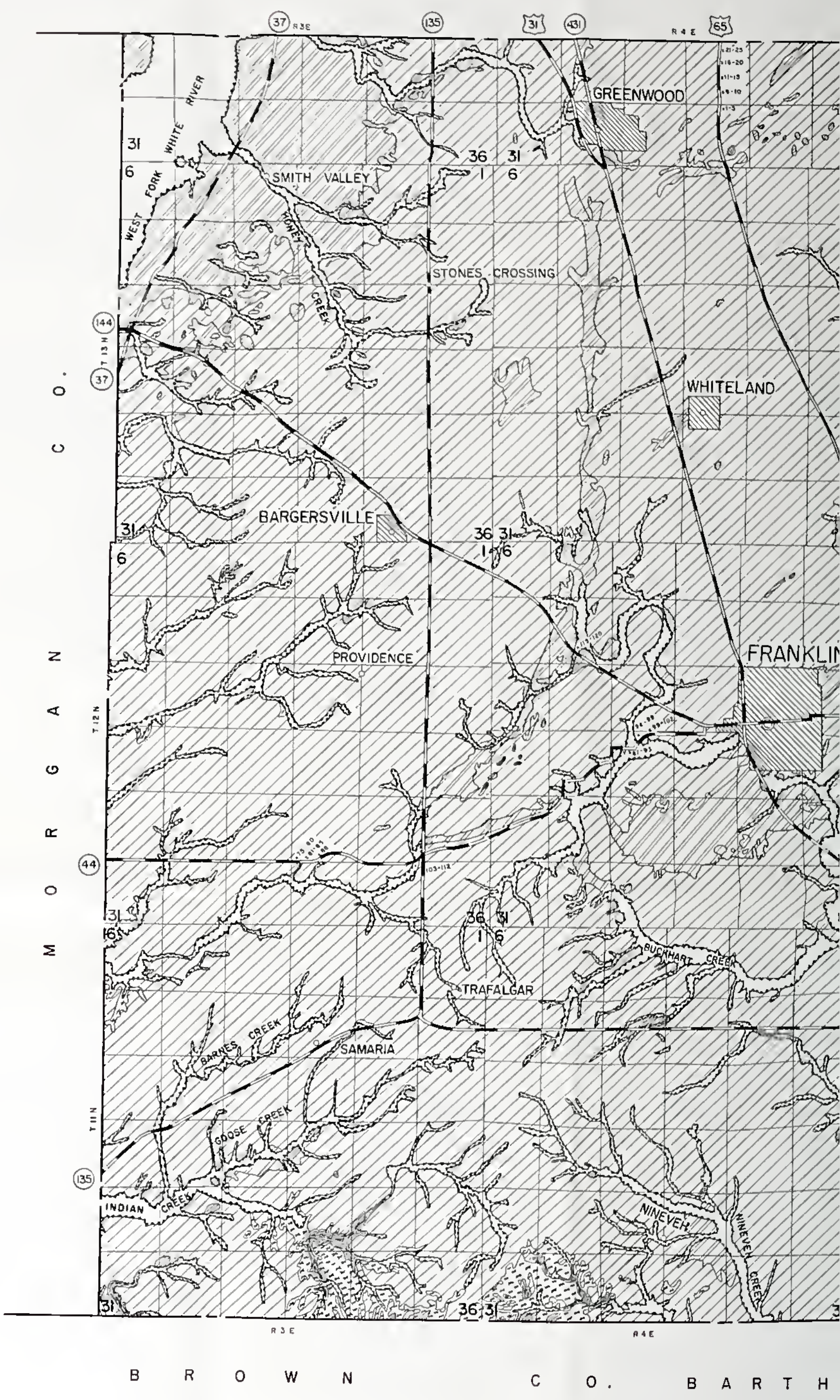


## ORGANIC DEPOSITS



## TEXTURAL SYMBOLS FOR SOIL PROFILES

| | | |
|---|---|---|
| GRAVEL | SAND | SILT |
| CLAY | LOAM | ■ MUCK |
| ORGANIC MATERIAL | SILT-STONE | SAND-STONE |



# ENGINEERING SOILS MAP

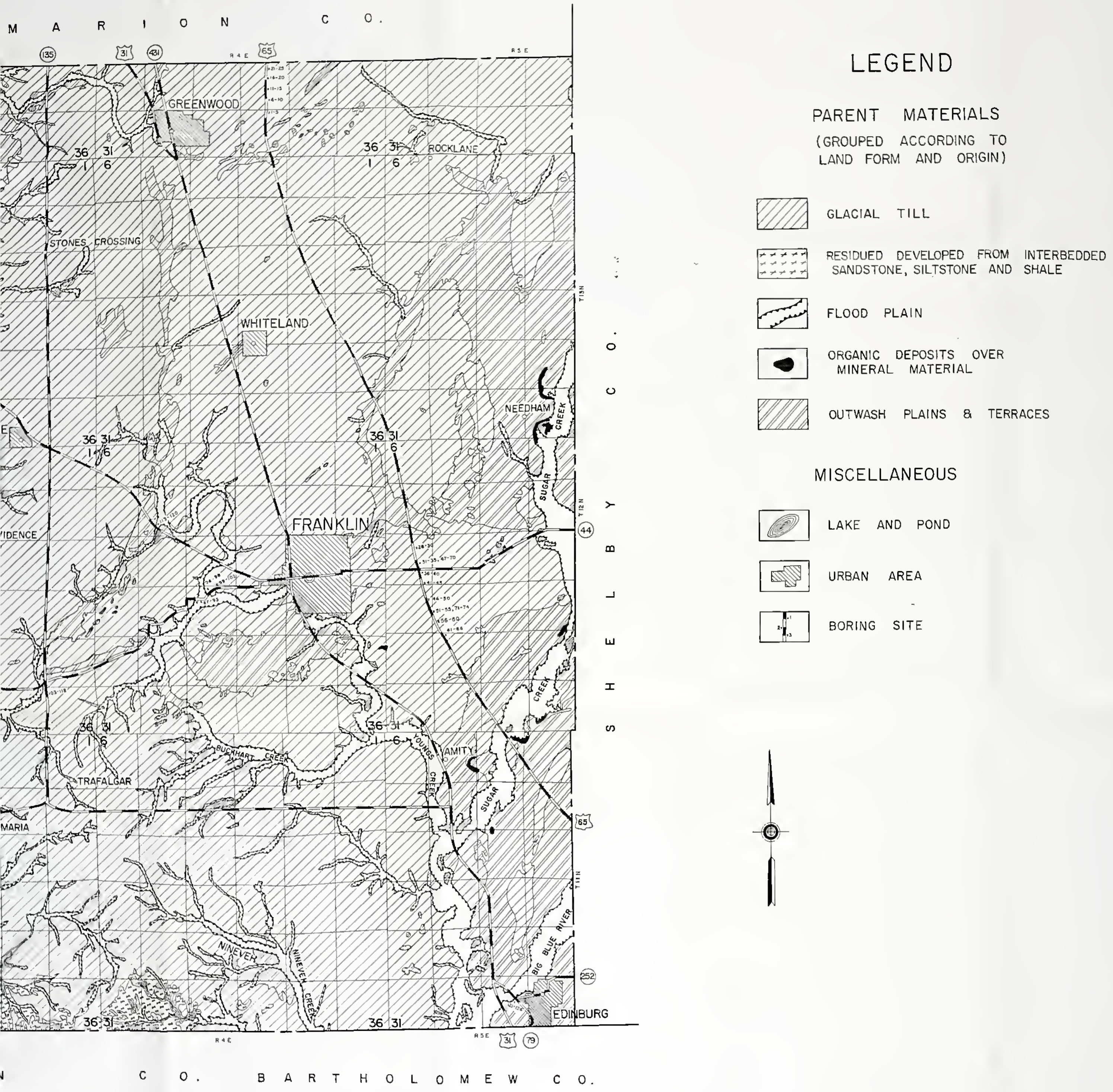
# JOHNSON COUNTY

## INDIANA

PREPARED FROM
1971 AAA AERIAL PHOTOGRAPHS
BY
JOINT HIGHWAY RESEARCH PROJECT
AT
PURDUE UNIVERSITY
1992

SCALE OF MILES
1 3/4 1/2 1/4 0 1 2 3 4

PREPARED UNDER THE SUPERVISION OF WEI-YAO CHEN, AND C·W LOVELL



# ENGINEERING SOILS MAP
# JOHNSON COUNTY
## INDIANA

PREPARED FROM
1971 AAA AERIAL PHOTOGRAPHS
BY
JOINT HIGHWAY RESEARCH PROJECT
AT
PURDUE UNIVERSITY
1992

SCALE OF MILES
1 1/4 1/2 1/4 0 1 2 3 4

DRAWN BY D. YANG

COVER DESIGN BY ALDO GIORGINI